IBM System Storage

IBM

DCS9550 1S1 Storage Expansion Unit Installation, Service, and User Guide

Preface

What is in this guide

This guide gives you step-by-step instructions on how to install, configure, and connect this product to your host computer. In addition, it provide instructions on how to operate and service this product.

Who should use this guide

This guide assumes that you have a working knowledge of the Fibre Channel Arbitrated Loop (FC-AL) and Advanced Technology Attachment (ATA) environments into which you are attaching the product. If you do not have these skills, or are not confident with the instructions in this guide, do not proceed with the installation.

NOTE :   Not all information contained in the following sections will pertain directly to your particular product model.

Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM System Storage DCS9550 product, and whom to call for service, if it is necessary.

Support information

For online support information for your IBM System Storage DCS9550 product, visit the following Web site:

www.ibm.com/support

For telephone support information, in the United States, contact IBM at 1-800-IBM-SERV (426-7378).

In other countries, visit the following Web site for support telephone numbers:

 www.ibm.com/planetwide/

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables on your hardware to make sure that they are connected properly.

- Check the power switches to make sure that the system is turned on.

- Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.

Using the documentation

Information about the DCS9550 product is available on a documentation CD that comes with your product. You can also access documents using the IBM Publications Center:

http://www.ibm.com/shop/publications/order

International Standards

This product complies with the requirements of the following agencies and standards:

- CE
- UL
- cUL

Qualified Personnel

The personnel qualified to use this device are referred to within this document as follows:

- **Service Person:** Someone with the appropriate and necessary technical training and experience to be aware of hazards to which they may be exposed in performing a task and of measures to minimize the risks to that person or other persons.

- **User/Operator**: Any person authorized to handle/operate the product other than a *Service Person.*

Safe Handling

Do not try to lift the enclosure by yourself. An enclosure can weigh from 9kg (19.8 lb) to 37kg (77.6lb). Before removing an enclosure from a rack cabinet, always first remove all modules and drives from the enclosure to minimize weight if necessary.

Do not try to lift the enclosure by the handles on the PSU/Cooling module. The handles are not designed to support the weight of the populated enclosure.
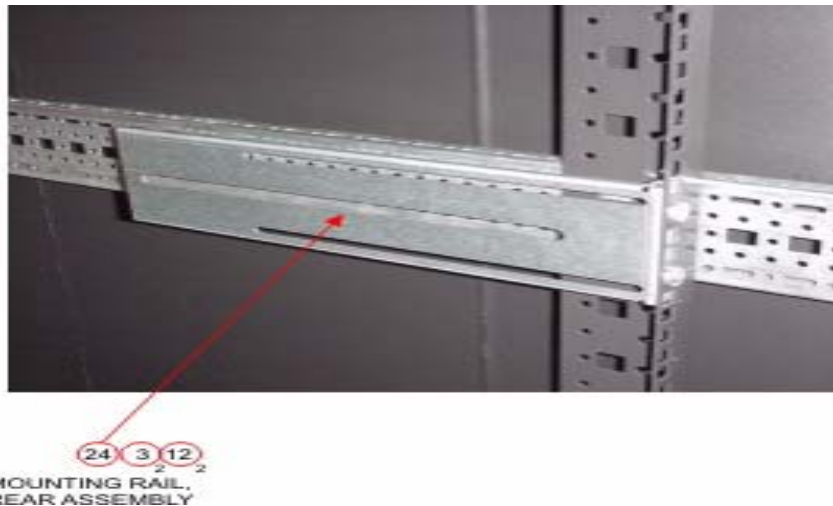

Figure P-1 Weight Handling Label: Lifting and Tipping

Figure P-2 Pinch Hazard Label: keep Hands Clear

Safety Guidelines

Caution ! If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired.

⚠️ **Warning** **The enclosure *MUST* be grounded before applying power.**

⚠️ **Warning** **Unplug the product if you think that it has become damaged in any way and before you move it.**

Caution ! Plug-in modules are part of the fire enclosure and must only be removed when a replacement can be immediately added. The system must not be run without all units in place. Operate the system with the enclosure top cover closed and blanking plates fitted where modules are missing.

To comply with applicable safety, emission, and thermal requirements, keep all enclosure covers securely fitted and keep all bays fitted with plug-in modules.

Enclosures must be only operated from a power supply input voltage range of 100 V AC to 240 V AC.When a redundant power input module is fitted, it must be operated from a reduced input voltage range of 200 V AC to 240 V AC.

The plug on the power supply cord is used as the main disconnect device. Ensure that the socket outlets are located near the product and are easily accessible.

The product is intended to operate with three working Plus. Before removal/replacement of any module disconnect all supply power for complete isolation.

⚠️ **Warning** **To ensure protection against electric shock caused by HIGH LEAKAGE CURRENT (TOUCH CURRENT), the enclosure must be connected to at least two separate and independent sources. This should ensure a reliable earth connection**
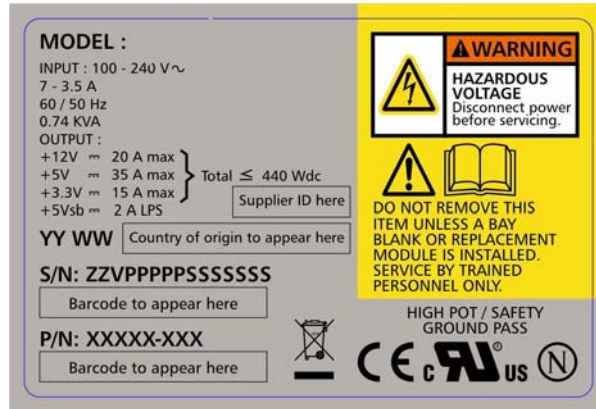

Figure P-3   **PSU/Cooling Module Caution Label:**

Do not operate with modules missing. A faulty power supply/cooling module must be replaced with a fully operational module within 24 hours.

> ⚠ **Warning** **To ensure your system has warning of a power failure, disconnect the power from the PSU by either the switch (where present) or by physically removing the power source, prior to removing the PSU from the enclosure.**

Do not remove a faulty power supply/cooling module unless you have a correct replacement product ready for insertion.

Figure P-4 PSU Warning Label (Power Hazards)

Always disconnect power to the product prior to removal of the power supply/cooling module from the product chassis.

Provide a safe electrical earth (ground) connection for the power cord.

Provide a suitable power source with electrical overload protection to meet the requirements detailed in the product's technical specifications.

> ⚠ **Warning** **Do not remove covers from the Power Supply Unit (PSU). The is the Danger of electric shock. Return the damaged PSU to your supplier for repair.**

Figure P-5 PSU Safety Label (Electric Shock Hazard Inside)
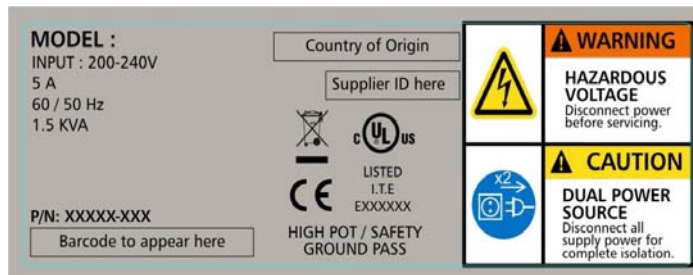
Figure P-6 Redundant Power Input Switch Module Label (Hazardous Voltage)

Operation of the product with *ANY* modules MISSING in the product's chassis will disrupt airflow and the drives will not receive sufficient cooling. It is *ESSENTIAL* that all bays in a product chassis are filled before operating the product.

Warning

Figure P-7 I/O Module Caution Label (Do not operate with modules missing)

Figure P-8   Drive Carrier Module Caution Label (Drive Spin down time 30 seconds)

Class 1 Laser Product

When the product is supplied with optical modules, it contain a laser that complies with Laser Class 1, US 21 QFR (J) & EN 60825-1, UL (NRTL) and TUV.

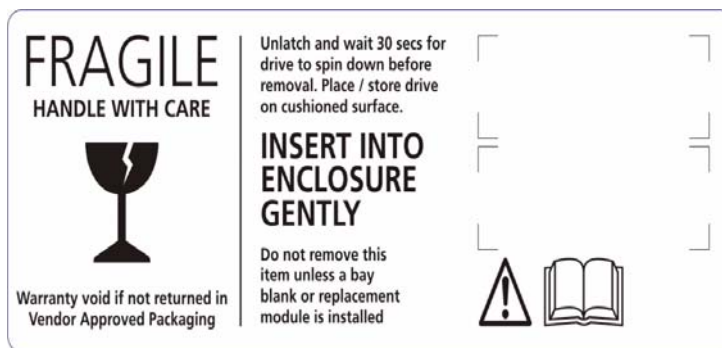**Caution !** If optical modules are to be provided and fitted by the end user, the modules must be a UL (or other North American NRTL) RECOGNISED COMPONENT, must be approved by TUV (or other European Product safety test house), and the laser in the module must comply with Laser Class 1, US 21 QFR (J) & EN 60825-1.

Important ! Observe all applicable safety precautions (for example, weight restrictions, handling batteries and lasers etc.) detailed in the preceding paragraphs when dismantling and disposing of this product or its components.

Electronic Emission Notices

Federal Communications Commission (FCC) Class A Statement

IBM is not responsible for any radio or television interference caused by unauthorized changes or modifications to this product. This product complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this product must not cause harmful interference, and (2) this product must accept any interference received, including interference that may cause undesired operation.

European Union (EU) Electromagnetic Compatibility Directive

This product conforms with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

European Community contact:

IBM Technical Regulations
Pascalstr. 100, Stuttgart, Germany 70569
Tele: 0049 (0)711 7851176
Fax: 0049 (0)711 785 1283
e-mail: tjahn@de.ibm.com

People's Republic of China Class A Electronic Emission Statement

中华人民共和国 "A类" 警告声明

声 明
此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，
可能需要用户对其干扰采取切实可行的措施。

Taiwan Class A Electronic Emission Statement

Japan VCCI Class A ITE Electronic Emission Statement

Industry Canada Class A Emission Compliance Statement

This Class A digital product complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conform à la norme NMB-003 du Canada.

Germany Electromagnetic Compatibility Directive

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 18. September 1998 (bzw. der EMC EG Richtlinie 89/336).

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die: IBM Deutschland Informationssysteme GmbH 70548 Stuttgart. **In**formationen in Hinsicht EMVG Paragraph 4 Abs. (1) 4:Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

EN 55022 Klasse A Gerate mussen mit folgendem Warnhinweis versehen werden: Warnung: dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstorungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Masnahmen durchzufuhren und dafur aufzukommen. Anmerkung: Um die Einhaltung des EMVG sicherzustellen, sind die Gerate wie in den IBM Handbuchern angegeben zu installieren und zu betreiben.

Korean Class A Electronic Emission Statement

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이기기는 업무용으로 전자파 적합등록을 받은 기기
이오니, 판매자 또는 사용자는 이점을 주의하시기
바라며, 만약 잘못 구입하셨을 때에는 구입한 곳에
서 비업무용으로 교환하시기 바랍니다.

Rack System Precautions

The following safety requirements must be considered when the product is mounted in a rack.

⚠ **Warning**   **Do not slide more than one product enclosure chassis out of the rack at a time, to avoid the rack from toppling over.**

ESD Precautions

Caution !   It is recommended that you wear a working (examine before wearing) anti-static wrist or ankle strap and observe all conventional ESD precautions when handling Chassis slug-in modules and components. Avoid contact with backplane components, module connectors, etc.

Data Security

- Before beginning product installation, power down your host computer and all attached peripheral devices.

- Disk drives are fragile. Handle them with care, and keep them away from strong magnetic fields.

- *All* the supplied plug-in modules and blanking plates must be in place for the air to flow correctly around the enclosure and to complete the internal circuitry.

- If the subsystem is used with modules or blanking plates missing for more than a few minutes, the enclosure can overheat, causing power failure and data loss.

- If you remove any drive module, you may lose data.

- If you remove a drive module, replace it immediately. Replace it with a drive module of the same type and capacity

- Do not abandon your backup routines. No system is completely foolproof.

Taiwan Contact Information

IBM Taiwan Product Service Contact Info:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd., Taipei Taiwan
Tel: 0800-016-888

台灣IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

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Internet: starpubs@us.ibm.com

You can also mail your comments by using the Readers' Comments Form in the back of this manual or direct your mail to:

International Business Machines Corporation
Information Development Dept. GZW
9000 South Rita Road
Tucson, AZ 85744–0001
U.S.A.

IBM System Storage DCS9550 1S1 Storage Expansion Unit Installation, Service, and User Guide

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Introduction

1.1   The IBM System Storage DCS9550 1S1 Storage Expansion Unit

Figure 1–1   The DCS9550 SATA Disk Chassis Model 1S1 System

The DCS9550 1S1 Storage Expansion Unit design concept is based on a subsystem together with a set of plug-in modules. The DCS9550 1S1 Storage Expansion Unit subsystem as supplied comprises:

- Chassis and Backplane with integral.Operators Panel.(See Figure 1–8)

- Up to 16 Serial ATA (SATA) Drive Carrier modules (See Figure 1–9)
  - Serial ATA (SATA) drives with appropriate switching card.

- Dummy drive carrier modules.

- Two AC, 450W Power Supply/Cooling plug-in modules (see Figure 1–4)

- One or two Serial ATA Control (SCM) Input/Output modules, dependent on configuration required: 1.5Gb internal operating speed with 1 Gb or 2Gb external operating speed. (See Figure 1–6).

1.1.1 Enclosure Chassis

The chassis consists of a sheet metal enclosure assembly containing a Backplane PCB and module runner system This chassis assembly also includes an integral Operators (Ops) Panel, mounted at the rear.

The chassis assembly contains 16 drive bays at the front, each of which accommodates a plug-in drive carrier module. The 16 drive bays are arranged in 4 rows of 4 drives. At the rear, the chassis assembly contains the integral ops panel and four module bays to house two Power Supply/Cooling modules, one SCM I/O module, and one blank SCM module filler.

The Backplane PCB provides logic level signal and low voltage power distribution paths. Figure 1–2 and Figure 1–3 show front and rear views of an RS-1602 chassis respectively.

Note   The DCS9550 1S1 Storage Expansion Unit is shipped in a preconfigured 42U rack configuration, except for the top three in the rack with the controllers or top two in an expansion rack. Refer to the *IBM System Storage DCS9550 Installation, Service, and User Guide.*

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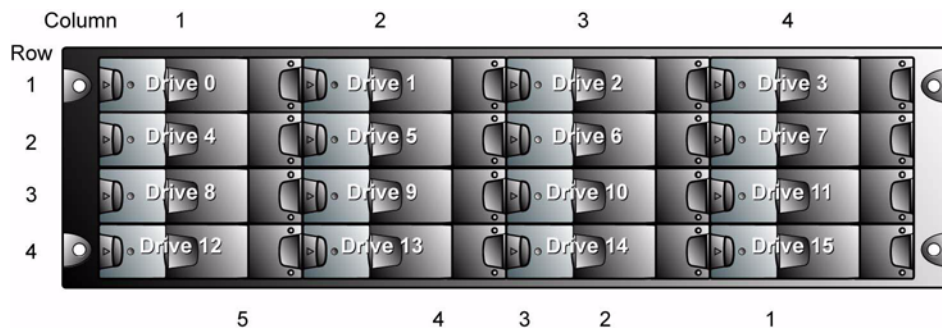
Figure 1–2   Enclosure Chassis (Front)
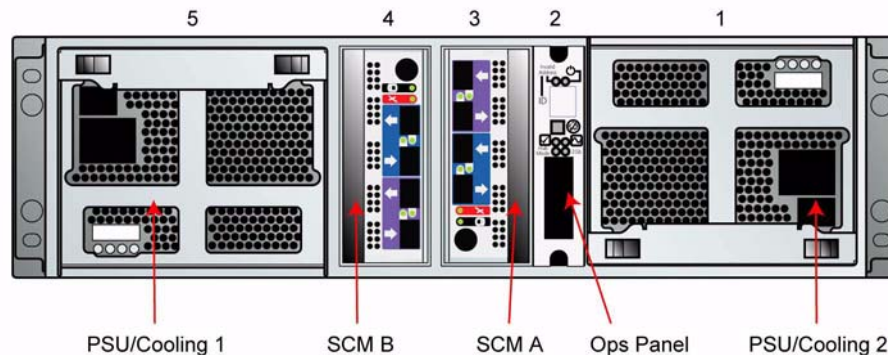
Figure 1–3   Enclosure Chassis (Rear)

1.2   The Plug-in Modules

An DCS9550 1S1 Storage Expansion Unit requires one or more of the following modules for normal operation:

1.2.1   Power Supply/Cooling Module

Two auto ranging AC 450WPower Supply/Cooling modules (Figure 1–4) are supplied mounted in the rear of the enclosure as part of the subsystem core product.
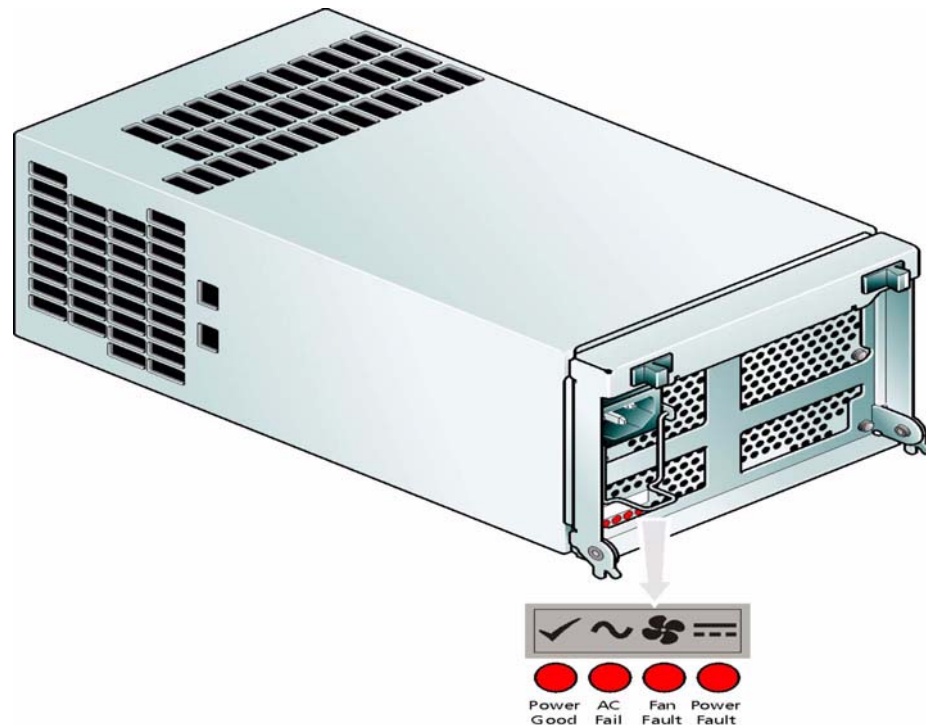
Figure 1–4   AC Power Supply/Cooling Module

PSU voltage operating ranges are nominally 115V or 230V AC, selected automatically.

Four   LEDs mounted on the front panel of the Power Supply/Cooling module (see Figure 2–1) indicate the status of the PSU and the fans.

1.2.1.1   Multiple Power Supply/Cooling Modules

The DCS9550 1S1 Storage Expansion Unit must always be operated with two Power Supply/Cooling modules fitted. The two Power Supply/Cooling modules operate together so that if one fails the other maintains the power supply and cooling while you replace the faulty unit.

Module replacement should only take a few minutes to perform but must be completed within 10 minutes from removal of the failed module.

1.2.2 Operators Panel

Supplied as an integral part of the Enclosure core product, a typical Operators (Ops) Panel is shown in Figure 1–5.
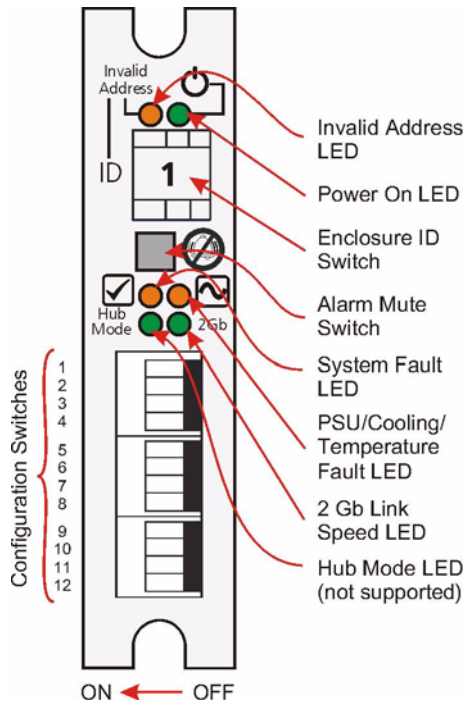
Figure 1–5   Ops Panel

The Ops Panel provides the enclosure with a micro controller which is used to monitor and control all elements of the Enclosure.

1.2.2.1 Ops Panel Indicators and Switches

The Ops Panel includes Light Emitting Diodes (LEDs) which show the status for all modules, an Audible Alarm which indicates when a fault state is present, a push-button Alarm Mute Switch and a thumb wheel Enclosure ID Switch.

The Ops Panel switch functions are shown in Table 1–1.

Table 1–1   Ops Panel Switch Functions (*Default settings for* DCS9550 1S1 Storage Expansion Unit*SCM usage at 2Gb/s)*

Switch Number *See Sw 11*	Function	Recommended Setting	Definition
1	Not Used	Off	
2	Not Used	Off	
3	Not Used	Off	
4	Not Used	Off	
5	Not Used	Off	
6	Not Used	Off	

Table 1–1 Ops Panel Switch Functions (*Default settings for* DCS9550 1S1 Storage Expansion Unit*SCM usage at 2Gb/s)*

Switch Number *See Sw 11*	Function	Recommended Setting		Definition
7 & 8	Drive Loop Speed Select	**Sw 7**	**Sw 8**	
DCS9550 Controller Settings		**Off**	**Off**	**Force 1Gb/s**
DCS9550 Controller Settings		**On**	**Off**	**Force 2Gb/s (recommended)**
9 & 10	Drive Addressing Mode Selection	**Sw 9**	**Sw 10**	
DCS9550 Controller Settings		Off	On	Mode 1
		On	On	Mode 0
		On	Off	Mode 2
		Off	Off	Mode 3 *(not supported)**
11	SOFT SELECT	On		Selects functions using the hardware switches
12	Not Used	Off		

Note: * Please contact your supplier for further information.

Important **Switch settings are only read at Power On.**

1.2.3 SCM Input/Output Module

The DCS9550 1S1 Storage Expansion Unit includes an enclosure with rear facing bays which houses one or two SATA Control Interface Adaptor (SCM I/O) modules (see Figure 1–3), dependent on configuration required.

The plug-in SCM I/O modules have been designed for integration into a DCS9550 1S1 Storage Expansion Unit, providing external FCAL cable interfacing with up to 16 SATA disk drives.

Processors housed on the SCM I/O modules provide enclosure management and interface to devices on the Backplane, PSU, SCM and Ops Panel, to monitor internal functions.

The module incorporates the following LED indicators:

Important **If only one SCM module is fitted, the SCM module must be installed in Rear Bay 4 location [see Figure 1–3, "Enclosure Chassis (Rear)", on page 2] and a Blank I/O module fitted in the unused bay.**

Table 1–2 SCM I/O Module LEDs

LED	Definition	Color	Normal Status	Fault Status
FC Host Port 0 Signal Good	Incoming FC signal is GOOD No connection or incorrect connection Invalid SFP connection	Green	**On**	**Off Flashing**

Table 1–2   SCM I/O Module LEDs

FC Host Port 1 Signal Good	Incoming FC signal is GOOD No connection or incorrect connection Invalid SFP connection	Green	**On**	**Off** **Flashing**
Router Status	Storage Router Device Ready Storage Router Device not ready or defective	Green	**On**	**Off**
ESI/SCM Module Fault	Fault present (also **On** *when booting)* Successful controller initialization	Amber	**Off**	**On**

Figure 1–6   SCM I/O Module
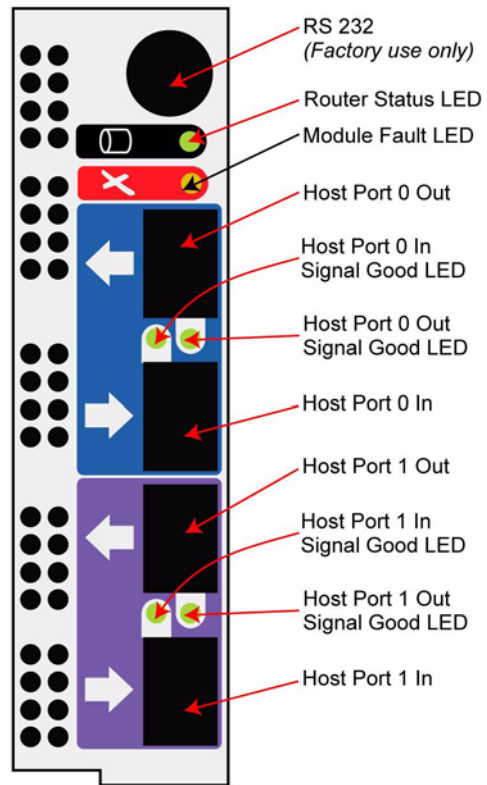
Figure 1–7 SCM Front Panel *(as viewed from rear of Enclosure)*
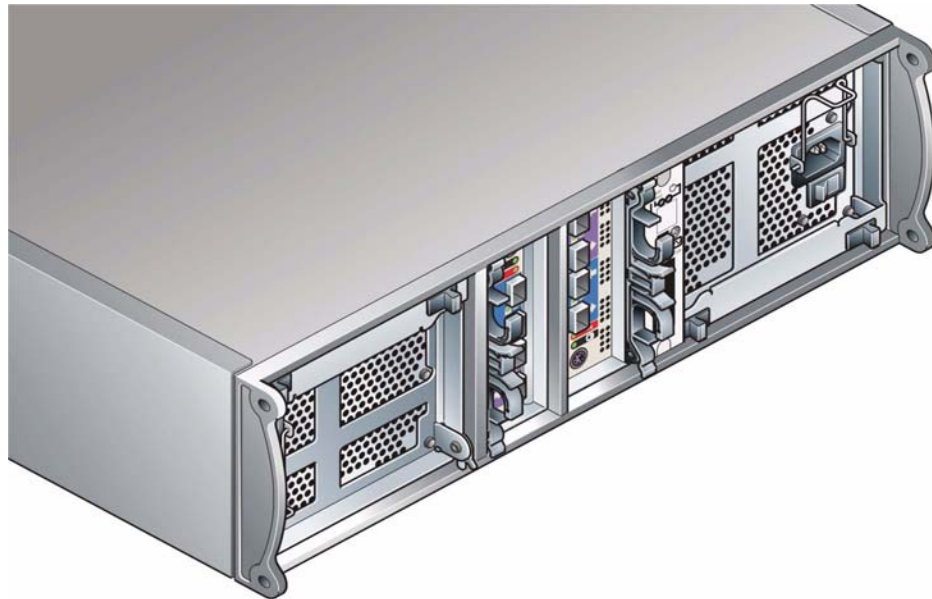
Figure 1–8 DCS9550 1S1 Storage Expansion Unit with SCM I/O Modules Installed

1.2.4   Drive Carrier Module

The Drive Carrier Module comprises a hard disk mounted in a carrier. Each drive bay can house a single Low Profile 1.0 inch high, 3.5 inch form factor disk drive in its carrier. The carrier has mounting locations for ATA or FC-AL drives.

Each disk drive is enclosed in a die-cast aluminum carrier which provides excellent thermal conduction, radio frequency, and electro-magnetic induction protection and affords the drive maximum physical protection.

The front cap also supports an ergonomic handle which provides the following functions:

- Camming of carrier into and out of drive bays.
- Positive 'spring loading' of the drive/backplane connector.
- An anti-tamper lock operated by a torx socket type key.
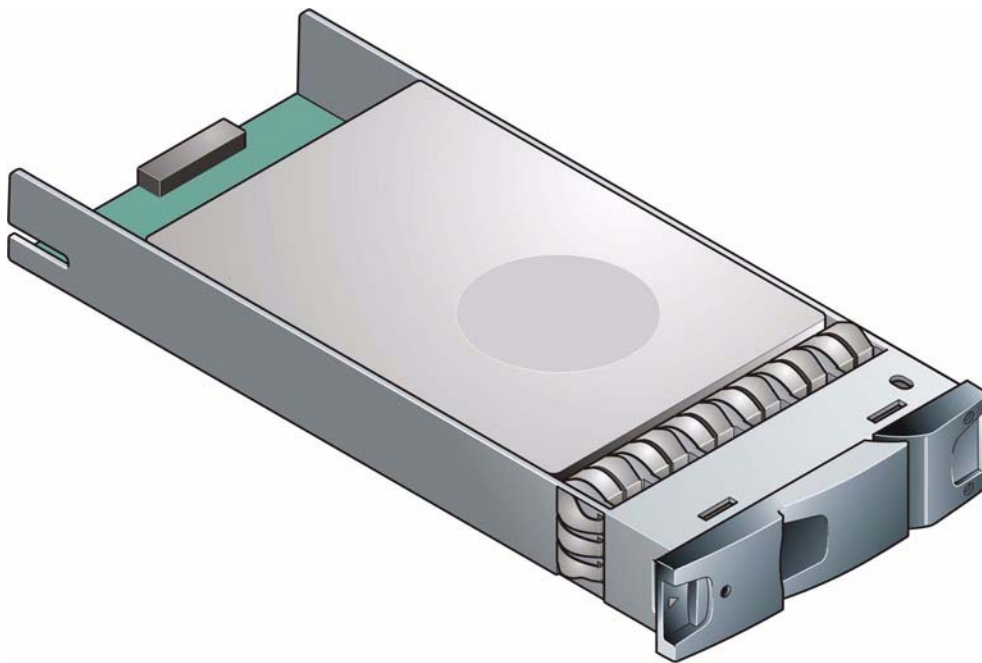
Figure 1–9   Drive Carrier Module

1.2.4.1   SATA Dual Path Transition Card

For SATA drives, a SATA dual path transition card is used in place of a SATA - PATA transition card. This is attached to the rear of each drive to provide a SCA-2 interface to the drive carrier using the same pins as Fibre Channel. In addition, the card provides a SATA path switch (1.5Gb/s) suitable for dual redundant I/O module applications.

1.2.4.2   Drive Status Indicators

Each drive carrier incorporates two indicators, an upper (Green) and lower (Amber). In normal operation the green indicator will be ON and will flicker as the drive operates.The amber indicator is OFF during normal operation and ON if there is a drive fault present.

1.2.4.3 Anti-tamper Locks

Anti-tamper locks are fitted in the drive carrier handles (Figure 1–10) and are accessed through the small cutout in the latch section of the handle.These are provided to disable the normal 'pinch' latch action of the carrier handle and so prevent accidental or unauthorized removal of drives.
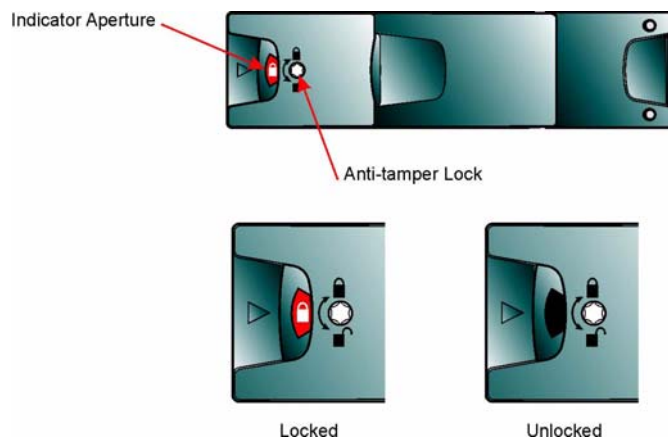
Figure 1–10   Anti-tamper Lock

1.2.5 Dummy Carrier Modules

Dummy carrier modules are provided for fitting in all unused drive bays. They are designed as integral drive module front caps with handles and must be fitted to all unused drive bays to maintain a balanced airflow.

1.2.6 Blank Modules

Blank SCM I/O modules must be fitted in the vacant SCM bay (slot 3) at the rear of the enclosure (Figure 1–3 on page 2 refers) to maintain airflow and ensure correct operation.

ATTENTION   **Operation of the Enclosure with *ANY* modules missing will disrupt the airflow and the drives will not receive sufficient cooling. It is *ESSENTIAL* that all apertures are filled before operating the unit. Dummy Carriers and/or Blank modules are available for this purpose.**

1.3 Visible and Audible Alarms

The functional modules have associated status LEDs. The Ops Panel shows a consolidated status for all modules.

LEDs show constant green for good or positive indication. Constant Amber LEDs indicate there is a fault present within that module.

The Ops Panel also incorporates an Audible Alarm to indicate when a fault state is present and also an Alarm Mute push-button.

ATTENTION   **The Ops Panel is an integral part of the enclosure chassis assembly and is not field replaceable.**

1.4 DCS9550 1S1 Storage Expansion Unit Technical Specification

1.4.1 Dimensions

Rack Enclosure	inches	millimeters
Height	5.12	130
Width across mounting flange	19.0	482
Depth	19.7	500

1.4.2 Weight

Fully loaded with 16 drives	37kg (77.6 lb)
Empty Enclosure	9kg (19.8lb)

1.4.3 AC Power (450W PSU)

Voltage Range	100-120 / 200-240 VAC Rated
Voltage Range Selection	Automatic
Frequency	50/60 Hz
Inrush Current	50A @ 260VAC
Power Factor	>0.98
Harmonics	Meets EN61000-3-2

1.4.4 PSU Safety and EMC Compliance

Safety Compliance	UL 60950
	IEC 60950
	EN 60950
EMC Compliance	CFR47 Part 15B Class A
	EN55022
	EN55024

1.4.5 Power Cord
(minimum requirements)

Cord Type	SV or SVT, 18 AWG minimum, 3 conductor
Plug	250V, 10A
Socket	IEC 320 C-14, 250V, 15A

1.4.6   Environment

Table 1–3   Ambient Temperature and Humidity

	Temperature Range	Relative Humidity	Max. Wet Bulb
Operational	5°C to 40°C	20% to 80% non-condensing	23°C
Non-Operational	0°C to +50°C	8% to 80% non-condensing	27°C
Storage	1°C to +60°C	8% to 80% non-condensing	29°C
Shipping	-40°C to +60°C	5% to 100% non-precipitating	29°C

Airflow   System must be operated with low pressure rear exhaust installation (Back pressure created by rack doors and obstacles not to exceed 5 pascals [0.5mm Water gauge])

Altitude, Operational   0 to 2133 m (0 to 7,000ft) (10,000ft at maximum ambient of 35°C)

Altitude, Non-Operational   -305 to 12,192m (-1000 to 40,000ft)

Shock, Operational   Vertical axis 5g peak 1/2 sine, 10ms

Shock, Non-Operational   30g 10ms 1/2 sine

Vibration, Operational   0.21grms 5-500 Hz Random

Vibration, Non-Operational   1.04grms 2-200 Hz Random

Vibration, Relocation   0.3g 2-200 Hz sine

Acoustics   Less than 6.0 LwA

Orientation & Mounting   19" Rack mount (3EIA Units)

- Rack Rails   To fit 800mm depth Racks compliant with IEC 297

- Rack Characteristics   Back pressure not exceeding 5 pascals (0.5mm water gauge)

Safety & Approvals   CE, UL, cUL

• EMC   EN55022 (CISPR - A), FCC A

1.4.7   Interfaces

Drive support   See drive carrier specification

Attachment   1 FCAL loop of 16 drives

Passive Backplane with 1 or 2 Loop Resiliency Circuit (SCM) I/O Modules.

Host Port: FC-AL SFP - SFP cables	Maximum external cable length: see manufacturer's specification

Expansion Port: SFP to SFP cables

1.4.8   SCM I/O Module Specification

Speed   1.5Gb/s internal to each drive, 1Gb/s or 2Gb/s external
   • Creates connections to a single loop of 16 drives

   • 1 External FC loop with two SFP connections

Mounting   Rear, single bays 3 and/or 4 *(see Figure 1–3)*

Connectors   • 2 x Expansion Ports: SFP connector
                          • 2 x Host Ports: SFP connector (2 per port)

LED Functions

FC Host Port 0 Signal Good	– Green: **On**: Incoming FC signal is GOOD – **Off**: no connection or incorrect connection – **Flashing:** Invalid SFP connection
FC Host Port 1 Signal Good	– Green: **On**: Incoming FC signal is GOOD – **Off**: no connection or incorrect connection – **Flashing:** Invalid SFP connection
Router Status	– Green: **On**: Storage Router Device Ready – **Off**: Storage Router Device not ready or defective
ESI/SCM Module Fault	– Amber: **On**: Fault present (also ***On*** *when booting)* – **Off**: successful controller initialization

Power Dissipation   20W max.

1.4.9   Drive Carrier Module Specification

Please contact your supplier for details of approved drives.

Important   **Operating the DCS9550 1S1 Storage Expansion Unit with non-approved drives may invalidate the warranty.**

Module Dimensions	Height 29.1mm Width 106.55mm Depth 44 mm
Weight	0.98kg (1.0" 36Gb drive)
Transition card	mounting locations for ATA - SATA drives with transition card attached
Operating Temperature	5° C to 40° C (when installed in an RS-1602 system enclosure with dual Power Supply/Cooling Modules)
Power Dissipation	17 Watts maximum

1.4.10 Software Enclosure Services (SES) Support

The enclosure has a sophisticated self-monitoring and reporting function which conforms to ANSI SES specifications.This reports on such topics as:

- Enclosure temperature
- Fan speed
- Drive condition
- Operator panel status

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2

Installation

In this chapter, you are shown how to install your DCS9550 1S1 Storage Expansion Unit and plug-in modules into an industry standard 19 inch rack cabinet.

Caution   When connecting up the DCS9550 1S1 Storage Expansion Unit, use only the power cords supplied or cords which match the specification quoted in section 1.4.5.

2.1   Planning Your Installation

Before you begin installation you should become familiar with the configuration requirements of your DCS9550 1S1 Storage Expansion Unit, detailed in Table 2–1. The correct positions of each of the optional plug-in modules are shown in Table 2–1. Please refer to sections 2.4 - 2.7 for details of SCM I/O module configurations and installation.

Table 2–1   DCS9550 1S1 Storage Expansion Unit Configuration

Module	Location
Drive Bays	**ALL drive bays must be fitted with either a drive carrier module or a dummy carrier, no bays should be left completely empty.** Drive carrier modules 0 & 15 provide SES Management Services.
Power Supply/ Cooling Modules	**Two Power Supply/Cooling modules must be fitted. Full power and cooling redundancy is provided while a faulty module is replaced. Install the Power Supply/Cooling modules in rear Bays 1 and 5.** **Note:** Rear bays are numbered from 1 to 5 commencing from the right side.
SCM I/O Module	**One SCM module should be installed in rear Bay 3. A blank module is fitted rear Bay 4.**

Table 2–1   DCS9550 1S1 Storage Expansion Unit Configuration

Module	Location
Blank SCM I/O Modules	**Install in rear Bay 4.**
Ops Panel	(integral part of chassis assembly). Installed in rear Bay 2.

> **Caution**   Dummy Carriers and Blank Modules MUST be fitted to ALL unused bays. There is inadequate drive cooling if any are left open.
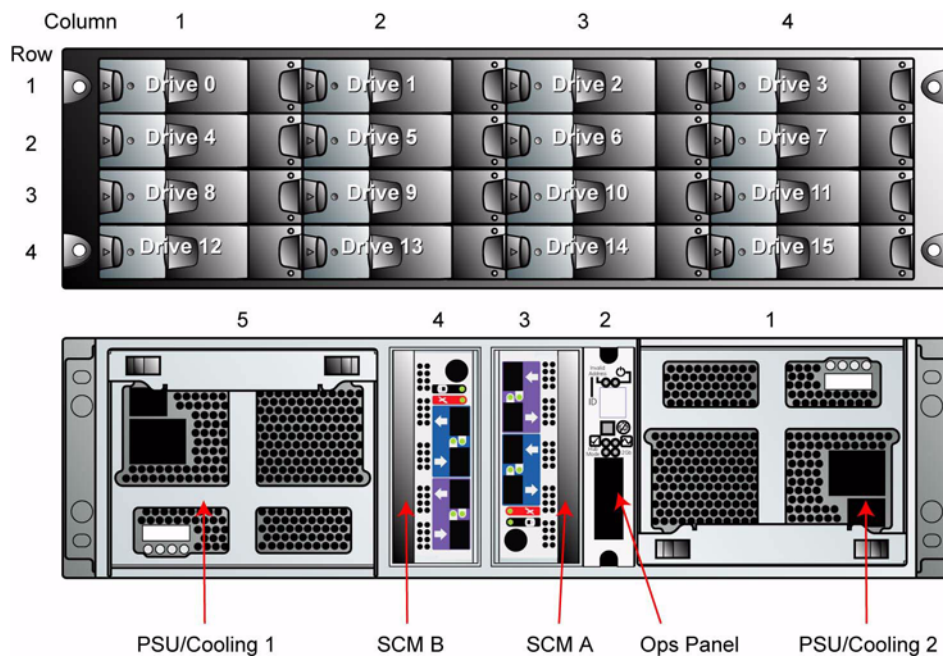
Figure 2–1   Module locations

2.1.1   Enclosure Bay Numbering Convention

The enclosure bay numbering convention is shown in Figure 2–1. A **bay** is defined as the space required to house a single 1.0 inch high 3.5 inch disk drive in its carrier module. For example, a 1 x 4 bay module would take the space of 1 drive width by 4 drive bays high (in the rack mount configuration).

The DCS9550 1S1 Storage Expansion Unit is housed in a 4 x 4 enclosure, that is, 4 bays wide by 4 bays high.

- The front bays are numbered 1 to 4 from left to right, as viewed from the front. Bays are numbered from 1 (top row) to 4 (bottom row). Drive Carrier Module locations are identified from a matrix of the top and side numbers.

- The rear bays are numbered 1 to 5 from right to left, as viewed from the rear.

2.2 Enclosure Installation Procedures

Caution	The DCS9550 1S1 Storage Expansion Unit with all its component parts installed is too heavy for a single person to easily install into a Rack cabinet. The following procedures describe the installation of the DCS9550 1S1 Storage Expansion Unit and highlights any critical co-requisite requirements and good handling practices which you should follow so as to ensure that a successful installation is achieved in the easiest manner.

⚠ Warning **Ensure that you have fitted and checked a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling DCS9550 1S1 Storage Expansion Unit modules and components. Avoid contact with Backplane components and module connectors, etc.**

2.2.1 Pre-Requisites

The DCS9550 1S1 Storage Expansion Unit is designed for installation into an industry standard 19 inch cabinet capable of holding the unit.

- Minimum depth: 500 mm from front flange to rear metalwork (excludes rear cabling).

- Weight: up to 37kg dependent upon configuration per enclosure.

- Clearances: a minimum gap of 25mm (1inch) clearance between the rack cover and front of drawer; and 50mm (2 inches) rear clearance between rear of drawer and rear of rack is recommended in order to maintain the correct air flow around the enclosure.

- Maximum back pressure: The rack should present a maximum back pressure of 5 pascals (0.5mm water gauge).

2.2.2 Rack Mounting Rail Kit

A set of mounting rails is available for use in 19 inch rack cabinets. These rails have been designed and tested to handle the maximum enclosure weight and to ensure that multiple DCS9550 1S1 Storage Expansion Unit may be installed without loss of space within the rack. Use of other mounting hardware may cause some loss of rack space.

2.2.2.1 Parts Check List
- Rack Mounting Rail Kit

2.2.3 Chassis Installation

2.2.3.1 Parts Check List

- Chassis (complete with Backplane and Ops Panel installed but excluding all plug-in modules).

• Rack mount front flange mounting screws (4 off).

2.2.3.2 Procedure

1 Check for damage.

2 Slide the chassis assembly onto the rack rails until the front flanges engage on the rack.

3 Ensure the chassis is centrally located. If in doubt about correct orientation, the drive bays (at front) should have their black drive connectors toward the bottom of each bay.

4 Screw the 4 front rack mount screws through the flanges and tighten.

5 Fit and tighten the rear hold down screws ensuring the enclosure is in tight contact to both the side and top of the chassis to avoid any movement of the chassis in the rack.

2.3 Power Supply/Cooling Module Installation
• Two power supply/cooling modules to be installed in the rear of the enclosure in positions 1 and 5.

⚠ **Warning** **Do not remove covers from the power supply unit. Danger of electric shock inside. Return the PSU to Customer Service for repair.**

2.3.1 Parts Check List
• 2 x AC, 450W Power Supply/Cooling Modules

2.3.2 Power Supply/Cooling Module Procedure

Important PSU1 (RH rear bay) must be fitted "upside-down"(Figure 2–1). If necessary, reorient the power cord clip so that the power cord can be properly retained.

1 Check for damage, especially to the rear connector on the supply.

Caution Handle the module carefully and avoid damaging the connector pins. Do not install the module if any pins appear to be bent.

2 With the PSU handle in the open position (Figure 2–2), slide the module into the enclosure (Figure 2–3).

| **Important** | Install the Power Supply/Cooling module (PSU 0) in the bay on the right side (Rear Bay 1) of the enclosure in an "upside down" orientation. If necessary, reorient the power cord clip so that the power cord can be properly retained. |

3 Cam the module home by manually closing the PSU handle (Figure 2–4). You should hear a click as the handle latches engage.

4 Connect the power supply cord to the power source and switch the power supply ON.
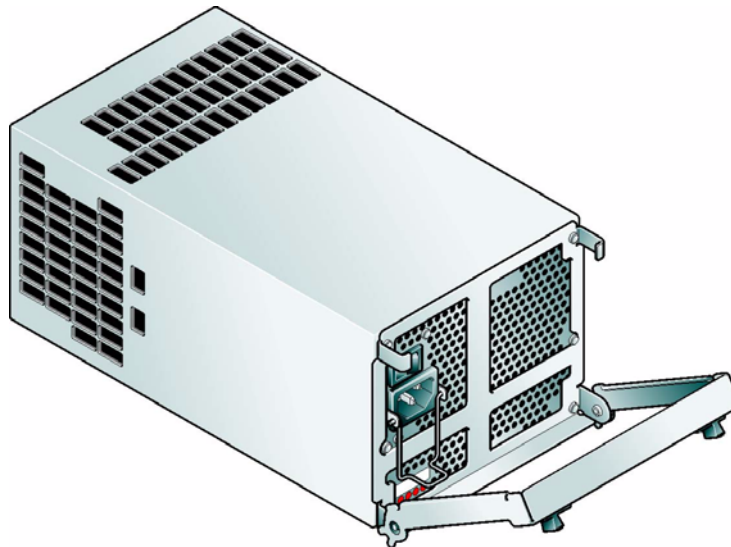

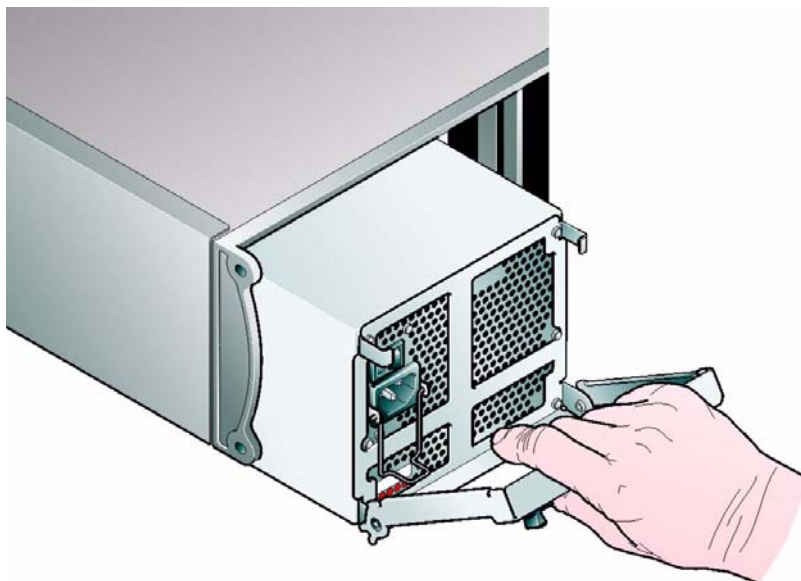**Figure 2–2**   AC Power Supply/Cooling Module - Handle in Open Position

Figure 2–3   Installing an AC Power Supply Cooling Module (1)
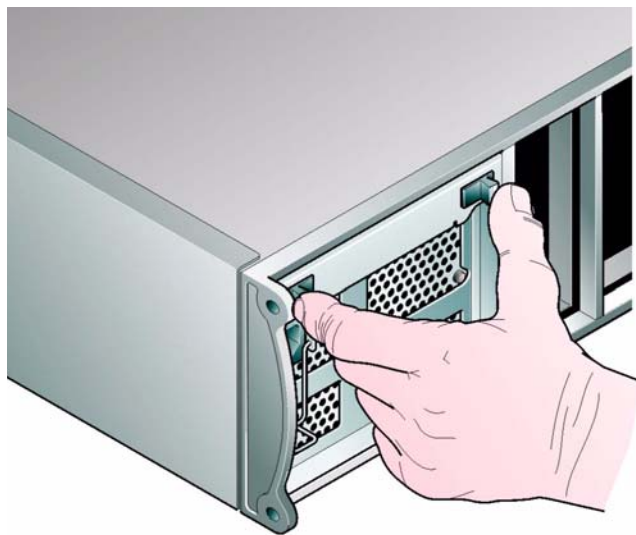
Figure 2–4   Installing an AC Power Supply Cooling Module (2)

2.4   SCM I/O Module Configurations

> **Important**   Please refer to section 2.9 for information on SATA drive configurations.

2.4.1   Internal Loop Structures

The DCS9550 1S1 Storage Expansion Unit is configured with one internal loop of 16 drives.

2.5   FC-AL Interface

The SCM (I/O) interface module provides an external FC-AL interface via SFP connection.The SCM module facilitates the emulation of fibre channel drives by ATA/SATA drives by converting FC protocols to ATA/SATA protocols. This is done through protocol conversion on the SCM module, which directly connects to each drive using the serial ATA protocol and then presents to the host via one FC loop hubbed to two or four SFP connections, depending on configuration.

> **Note**   There are no external terminators required with Fibre Channel architecture and any drive may be hot plugged during operation.

2.6   Cabling the IBM System Storage DCS9550 1S1 Storage Expansion Unit

The following figures illustrates how to cable the DCS9550 1S1 Storage Expansion Unit to the couplets (Unit 1 and Unit 2) and the couplets to each other.
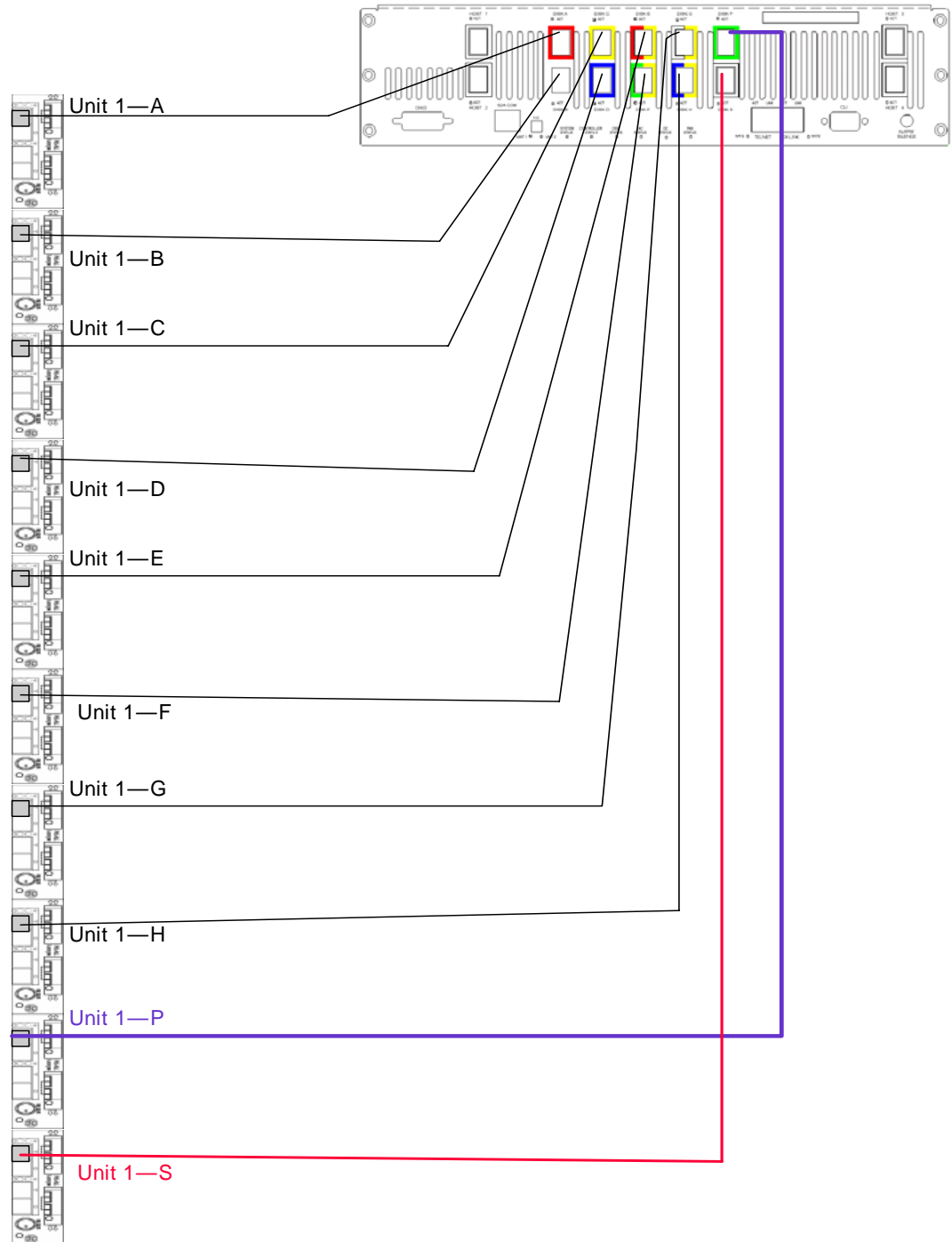
Figure 2–5   DCS9550 1S1 Storage Expansion Unit: Unit #1 Cabling

Unit 2—A

Unit 2—B

Unit 2—C

Unit 2—D

Unit 2—E

Unit 2—F

Unit 2—G

Unit 2—H

Unit 2—P

Unit 2—S
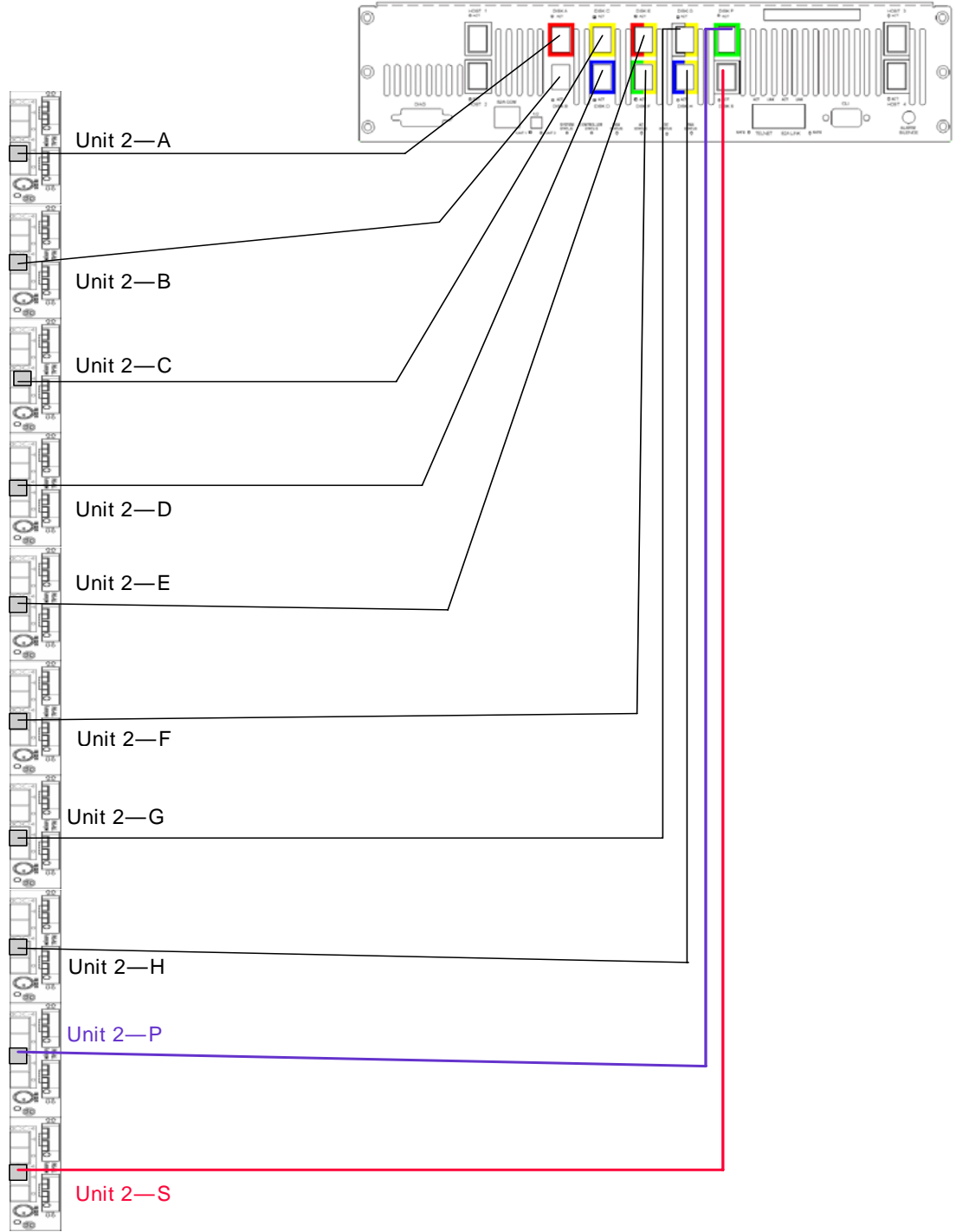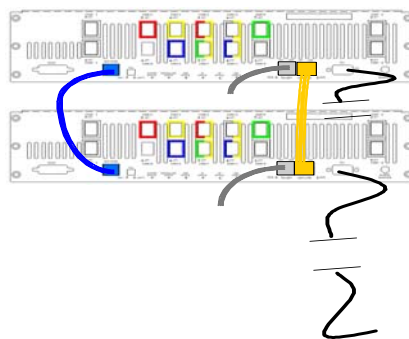
Figure 2–7   IBM System Storage DCS9550 Couplet Cabling

2.7   SCM I/O Module Installation

Important   The SCM I/O modules must be installed in Rear Bay 3 and 4 location [see Figure 2–1, "Module locations", on page 16].

2.7.1   Procedure

Check for damage especially to the interface connector. Do not install if any pins are bent.
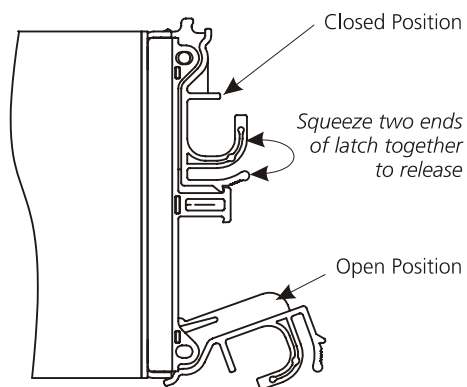
Figure 2–8   SCM Module Latch Operation

1   Install the module in rear Bay 3 of the enclosure (Figure 2–1).

2   With the latch in the open position (see Figure 2–8), slide the SCM module into the enclosure until the latch engages automatically.

3   Cam the module home by manually closing the latches (see Figure 2–9). You should hear a click as the latch engages.
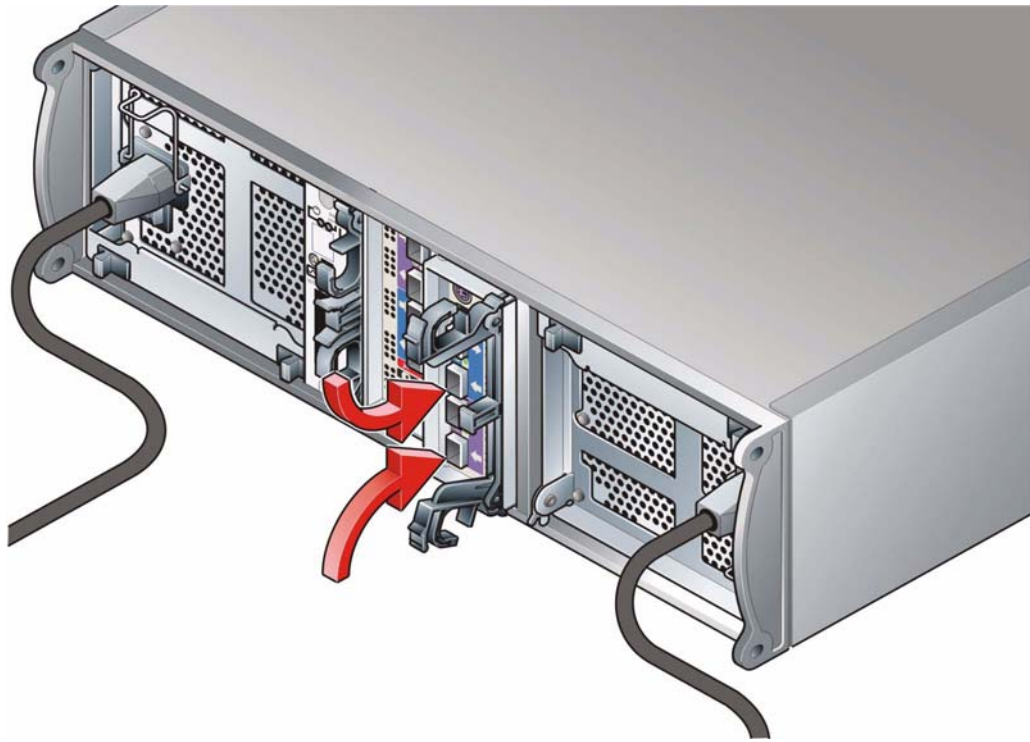
Figure 2–9   Installing an SCM I/O Module in Bay 4

2.8   Drive Enclosure Device Addressing

Each enclosure has 16 drive bays. The SEL_ID of each drive is determined by the device slot (0-15) in which it is installed and the address range setting, which is set by means of the Enclosure ID switch on the Ops Panel (shown in Figure 1–2 on page 2) at the rear of the enclosure. The switch settings are shown in Table 2–2

Table 2–2   Ops Panel Switch Functions (*Default settings for DCS9550 1S1 Storage Expansion Unit SCM usage at 1Gb/s)*

Switch Number	Function	Recommended Setting		Definition
1 thru 6	Not Used	Off		
7 & 8	Drive Loop Speed Select	**Sw 7**	**Sw 8**	
DCS9550 Controllers		On	Off	Force 2Gb/s
9 & 10	Drive Addressing Mode Selection	**Sw 9**	**Sw 10**	
DCS9550 Controllers		Off	On	Mode 1

Table 2–2 Ops Panel Switch Functions (*Default settings for DCS9550 1S1 Storage Expansion Unit SCM usage at 1Gb/s)*

Switch Number	Function	Recommended Setting	Definition
11	SOFT SELECT	On	Selects functions using the hardware switches
12	Not Used	Off	

Notes **1** ON = switch to the left, OFF = switch to the right.

Table 2–3 Mode 1 Drive Addressing

Thumb Wheel Switch	Device Slot SEL_ID Mode 1															
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
NOTE:	Thumbwheel switch setting 0 causes a blinking amber LED indicating an invalid ID condition; however, actual addressing is as stated.															
1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
3	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
4	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
5	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
6	80	81	82	83	84	85	65	87	88	89	90	91	92	93	94	95
7	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
8	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
9	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
10	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
11	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
12	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
13	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
14	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
15	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111

Table 2–4 Drive Slot Arrangement: Enclosure Front View

Row/ Column	1/#	2/#	3/#	4/#
#/1	Drive 0*	Drive 1	Drive 2	Drive 3
#/2	Drive 4	Drive 5	Drive 6	Drive 7
#/3	Drive 8	Drive 9	Drive 10	Drive 11
#/4	Drive 12	Drive 13	Drive 14	Drive 15*

Notes   **1** Drives are numbered row/column.

        2 With only one active PSU the enclosure takes approximately 96 seconds to start all drives from Power On.

        3 * Denotes SES drives which should always be fitted.

2.9 Drive Carrier Configuration

2.9.1 Planning and Configuring Your Installation

2.9.1.1 System Configuration

Important Before you begin installation you should become familiar with the configuration requirements of your DCS9550 1S1 Storage Expansion Unit. Please refer to Section 2.1 for information on your overall system configurations.

There must be a drive present in Bay 1/1 (drive 0) or 4/4 (drive 15) to enable SES Communications to operate. Installing drives in both of these bays provides redundant SES communication paths.

When planning your system configuration, please remember that:
- All DCS9550 1S1 Storage Expansion Unit drive bays must be filled with either a drive carrier or front dummy fascia. No bays should be left completely empty.

2.9.1.2 Drive Configuration

Important After you have installed the drive carrier modules in your DCS9550 1S1 Storage Expansion Unit, please refer to Section 2.4 for configuration information relevant to the I/O module you are installing.

2.10 Drive Carrier Installation

2.10.1 Parts Check List

- Drive Carrier module, or

- Dummy Carrier module

2.10.2 Procedure

1 Ensure that the anti-tamper lock is disengaged.

2 Release the carrier handle by pressing the latch in the handle towards the right.

3 Insert the carrier into the enclosure (Figure 2–10).

Important	**For a Rack Mounted System:** Ensure that the carrier is oriented so that the drive is uppermost and the handle opens from the left. Slide the carrier, gently, all the way into the enclosure until it is stopped by the camming lever on the right of the carrier (Figure 2–11).

4 Cam the carrier home - the camming foot on the base of the carrier engages into a slot in the enclosure. Continue to push firmly until the handle fully engages. You should hear a click as the latch engages and holds the handle closed (Figure 2–12).

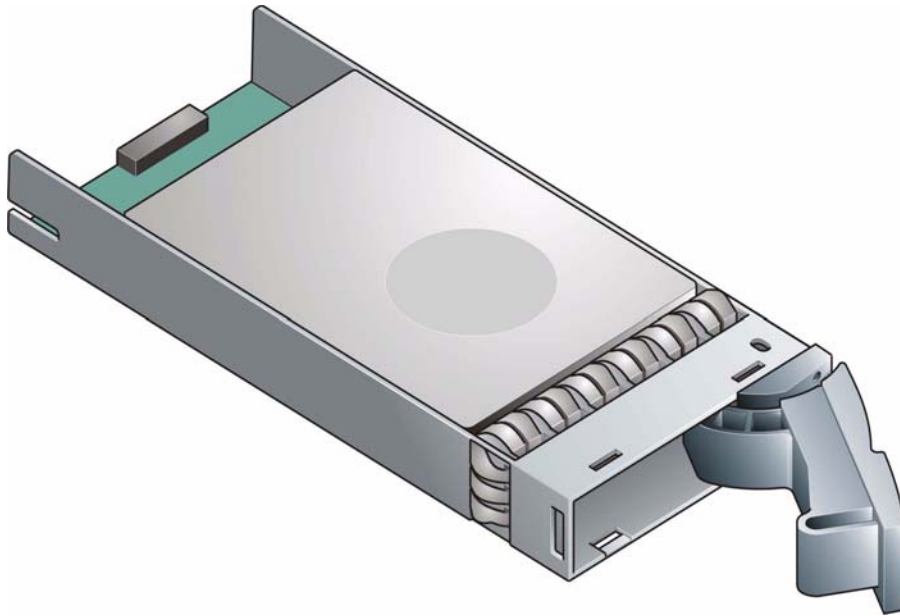|	
Note	Ensure that the Handle always opens from the left.

Figure 2–10   Installing a SATA Drive Carrier Module (1)
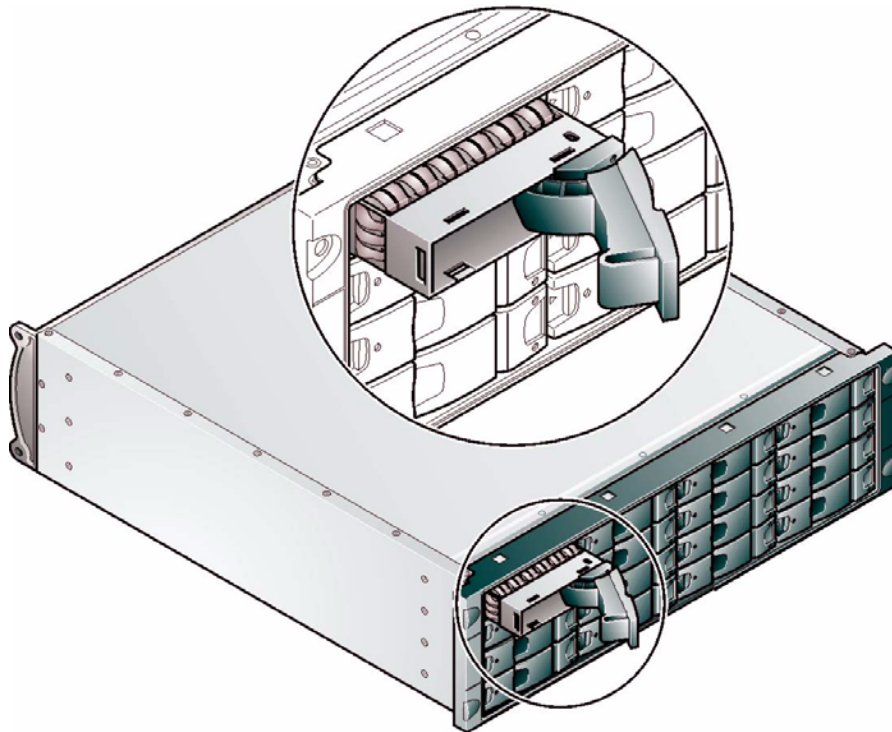

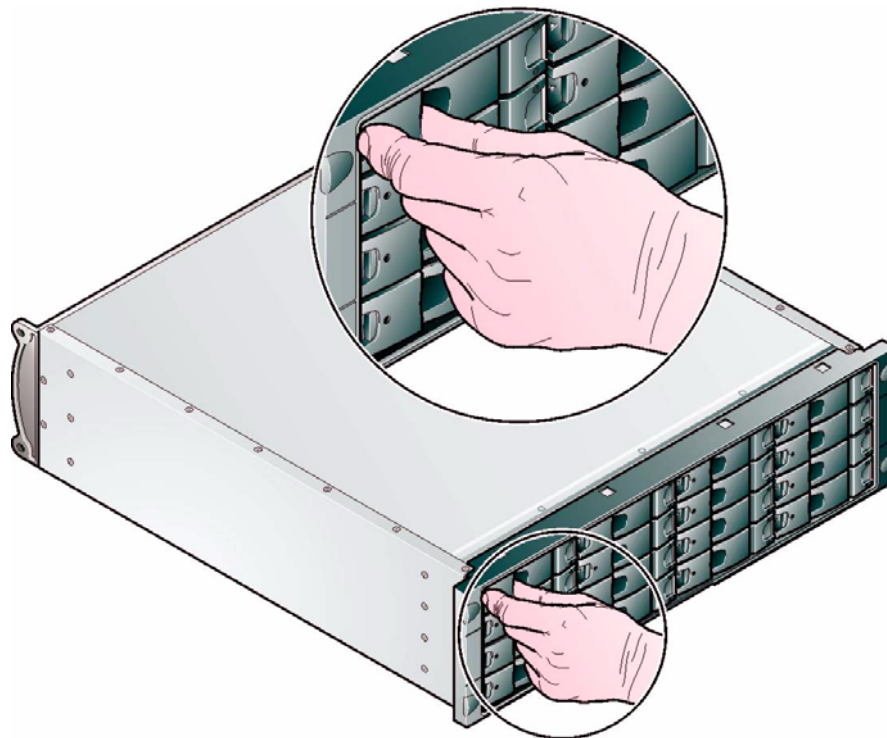**Figure 2–11**   Installing a SATA Drive Carrier Module (2)

Figure 2–12   Installing an SATA Drive Carrier Module (3)

> **Note**   Removal is the reverse of this procedure (press on the latch to release the handle).

2.10.3   Dummy Carrier Modules

Any unused drive bays must be fitted with a dummy carrier module.

2.10.4   Engaging the Anti-tamper Locks

The anti-tamper locks are fitted in the drive carrier handles and are accessed through the small cutout in the latch section of the handle.

Drives are supplied with the locks set in the locked position.

2.10.4.1   Activating the Locks

1   Carefully insert the lock key provided into the cutout in the handle.

2   Locate the key into its socket.

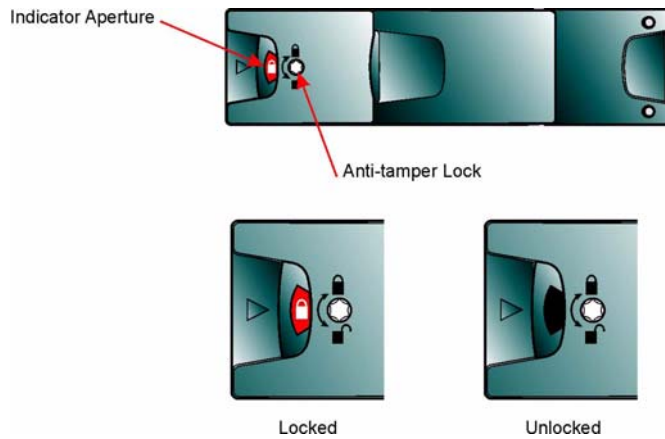3   Rotate the key in a clockwise direction until the indicator is visible in the aperture beside the key.

Figure 2–13   Activating the Anti-tamper Lock

4   Remove the key.
De-activation is the reverse of this procedure. To deactivate, rotate the key in an anti-clockwise direction until the indicator is no longer visible in the aperture beside the key.

> **Note**   A drive carrier cannot be installed if its anti-tamper lock is activated outside the enclosure.

2.11   Power Cord Connection

2.11.1   Parts Check List
- Power cord to requisite local standards

2.11.2   Procedure

1   Attach the power cord to the Power Supply/Cooling Modules.

2   Attach the power cord to the in-line IEC connector in this cord.

3   Switch on each Power Supply/Cooling Module. The PSU Good and AC Fail LEDs on the PSU indicate whether AC mains power is present.

> **Caution**   The power connections must always be disconnected prior to removal of the Power Supply/Cooling module from the enclosure.

2.12 Grounding Checks

The product must only be connected to a power source that has a safety electrical earth connection.

Warning	If more than one product is fitted in a rack, the earth connection to the rack is even more important, because the rack will then have a high "EARTH LEAKAGE CURRENT" ("TOUCH CURRENT").

The earth connection to the rack must be checked before switching on by an electrical engineer who is qualified to the appropriate local and national standards to perform the check.

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IBM System Storage DCS9550 1S1 Storage Expansion Unit Installation, Service, and User Guide

3

Operation

Before powering up the enclosure please ensure that all the modules are firmly seated in their correct bays.

3.1 Power On

Caution	Do not operate the subsystem until the ambient temperature is within the specified operating range. If the drives have been recently installed ensure they have had time to acclimatize before operating them.

Note	Please refer to Section h2-Heading for details of the Ops Panel LEDs and related fault conditions.

Follow the procedure below to Power On the enclosure.

1 Apply AC Mains power to the enclosure. Turn the Power Supply modules to ON.

2 On the Ops Panel, the Audible Alarm beeps once, all LEDs flash for 7 seconds then the Alarm double beeps.

3 All LEDs on the Ops Panel should be lit (Green) when the enclosure power is activated (and the disk drive motors should start).

Note	All LEDs on the Ops Panel should be lit Green at power up to indicate that the system is functioning correctly. If any show Amber then a problem exists.

If mains power is lost for any reason, on restoration of power the enclosure will re-start automatically.

3.1.1 Power Supply/Cooling Module LEDs

The Power Supply/Cooling module incorporates 4 LEDs, located below the On/Off switch and shown in tablecap.

- Under Normal conditions the LEDs should all be illuminated constant GREEN
- If a problem is detected the color of the relevant LED will change to AMBER.

Table 3–1   PSU LEDs

AC PSU	
Power AC Fan Power Good Fail Fault Fault	
PSU Good	**Green**
AC input Fail	**Amber**
Fan Fault	**Amber**
DC Output Fail	**Amber**

3.2 Ops Panel LEDs

The Ops Panel LEDs fault and status conditions are defined in Table 3-2 and shown in Figure 3-1.
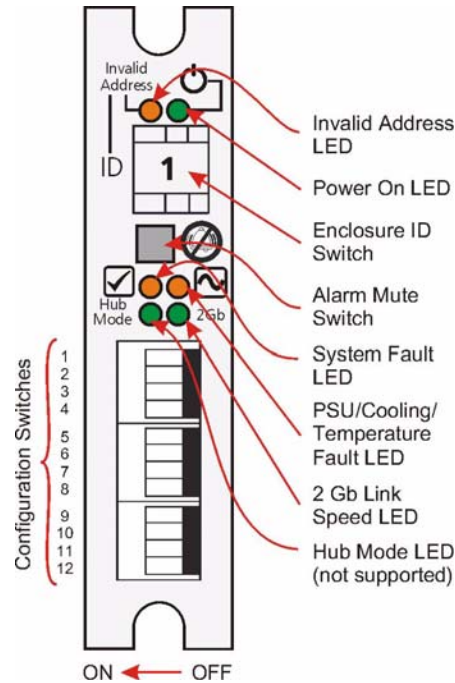

Figure 3–1   Ops Panel LEDs and Switches

Please refer to Chapter 4, *Troubleshooting and Problem Solving* for details of any fault indication.

Table 3–2 Ops Panel LED States

LED	Definition	Color	Normal Status	Fault Status
Invalid Address	Indicates that an invalid Enclosure ID has been selected or that the selection has changed after Power On	Amber	Off	Flashing
Power On	Enclosure Powered On	Green	On	Off
System Fault	System/SCM Fault	Amber	Off	On
PSU/Cooling Fault	PSU Cooling fault or enclosure over-temperature.	Amber	Off	On

Table 3–2 Ops Panel LED States

LED	Definition	Color	Normal Status	Fault Status
2Gb Link Speed	Indicates link speed	Green	Off	On
Hub Mode	Not Used	Green	Off	Off

3.3 Starting the Drives

Unless otherwise selected during installation, all drives in the enclosure should automatically start their motors. If this has not occurred one of the following conditions may exist:

- There may be a power problem (an alarm and power fault indication would normally be active).

- If there is only one Power Supply/Cooling Module present, the drive motors will spin up in a delayed sequence.

3.3.1 Disk Drives LEDs

Each drive carrier incorporates two indicators, an upper (GREEN) and lower (AMBER). In normal operation the Green LED will be ON and will flicker as the drive operates.The amber indicator is OFF during normal operation and ON if there is a drive fault present.

3.4 Power Down

To power the Enclosure down,

either

- Switch off the Power Supply/Cooling modules installed in the Enclosure.

or

- Remove AC Mains at the power source

4

Troubleshooting and Problem Solving

The DCS9550 1S1 Storage Expansion Unit includes a processor and associated monitoring and control logic to enable it to diagnose problems within the enclosure's power, cooling and drive systems. The Enclosure Services Processor is housed along with the Ops Panel in the rear of the enclosure. The sensors for power and cooling conditions are housed within the Power Supply/Cooling modules. There is independent monitoring for each unit. If a fault is indicated on the Ops Panel, please refer to Table 4–2.

4.1 Emulation Limitations

Each SCM presents each SATA disk drive as a single ported FC device. However unlike real FC-AL device certain data such as emulated WWN is not available on Power On, so the emulated devices will not present on the FC loop and participate in FC loop initialization until the drive has spun up. Please note that your RAID Head/Host system needs to be aware of this extra spin up time during Power On situations, whether they be planned ON or NOT ON (e.g. as the result of an unexpected power interrupt). Where some features, such as mode pages are not directly supported these will be emulated by the device, but changing these mode pages may not cause a change in the drive's behavior, Where an equivalent function exists, e.g. SMART data, the ATA SMART data will be presented to the Host through the CF SCSI command set.

4.2 Initial Start-up Problems

4.2.1 Faulty Cords

First check that you have wired up the subsystem correctly. Then, if:

- cords are missing or damaged
- plugs are incorrect
- cords are too short

Call your supplier for a replacement.

4.2.2 Alarm Sounds On Power Up

Please refer to Section 4.4.

4.2.3 Green "Signal Good" LED on SCM Not Lit

Check that the cables have not been reversed during installation.

4.2.4 Computer Doesn't Recognize the DCS9550 1S1 Storage Expansion Unit

1   Check that the FC-AL interface cables from the DCS9550 1S1 Storage Expansion Unit to the host computer, or RAID controller, are fitted correctly.

2   Check the Enclosure ID switch settings on your DCS9550 1S1 Storage Expansion Unit and on your system host.

3   Check that the LEDs on all installed drive carrier modules are illuminated Green. Note that the drive LEDs will not be lit during drive spinup.

4   Check that all drive carrier modules have been correctly installed.

5   Check that there is a valid FC_AL signal present at the I/O connector (see section 2.4.1.) If there is no signal present check that the cable has not been reversed during installation.

6   Check the SCM I/O module setup as follows:
   - Check that the SCM I/O module has been correctly installed and all external links and cables are securely fitted.
   - Check that the maximum cable length has not been exceeded.

4.3 LEDs

Green LEDs are always used for good or positive indication, flashing Green/Amber if non-critical conditions exist. Amber LEDs indicate there is a critical fault present within the module.

4.3.1 Power Supply/Cooling Module

The Power Supply Cooling LEDs are shown in Table 4–1.

- Under Normal conditions the LEDs should all be illuminated constant GREEN
- If a problem is detected the color of the relevant LED will change to AMBER.

Table 4–1   PSU LEDs

AC PSU	LED	Status
 Power AC Fan Power Good Fail Fault Fault	• **PSU Good**	**Green**
	• **AC input Fail**	**Amber**
	• **Fan Fault**	**Amber**
	• **DC Output Fail**	**Amber**

4.3.2   Ops Panel

The Ops Panel displays the aggregated status of all the modules. The Ops Panel LEDs are shown in Figure 4–1 and defined in Table 4–2. For details on how to remove and replace a module see Section 4.9.

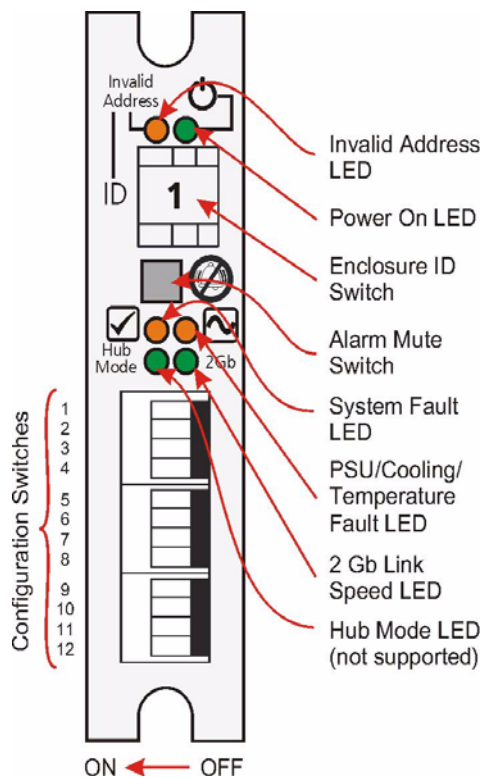**Note**   The Ops Panel is supplied as an integral part of the Enclosure core product and is not user replaceable.

Figure 4–1   Ops Panel

Table 4–2 Ops Panel LED States

LED	Definition	Color	Normal Status	Fault Status
Invalid Address	Indicates that an invalid Enclosure ID has been selected or that the selection has changed after Power On	Amber	Off	Flashing
Power On	Enclosure Powered On	Green	On	Off
System Fault	System/SCM Fault	Amber	Off	On
PSU/Cooling Fault	PSU Cooling fault or enclosure over-temperature.	Amber	Off	On
2Gb Link Speed	Indicates link speed	Green	Off	On
Hub Mode	Not Used	Green	Off	Off

4.3.3 SCM I/O Module LEDs

The SCM I/O module LEDs are shown in Table 4–3.

Table 4–3   SCM I/O Module LEDs

LED	Definition	Color	Normal Status	Fault Status
FC Host Port 0 Signal Good	Incoming FC signal is GOOD No connection or incorrect connection Invalid SFP connection	Green	On	Off Flashing
FC Host Port 1 Signal Good	Incoming FC signal is GOOD No connection or incorrect connection Invalid SFP connection	Green	On	Off Flashing
Router Status	Storage Router Device Ready Storage Router Device not ready or defective	Green	On	Off
ESI/SCM Module Fault	Fault present (also *On when booting)* Successful controller initialization	Amber	On	Off

4.4 Audible Alarm

The Ops Panel also includes an Audible Alarm which indicates when a fault state is present. The following conditions will activate the Audible Alarm:

- Drive Fault
- Fan Fault
- Voltage out of range
- Thermal overrun
- System fault

4.4.1 Audible Alarm Mute

When the Audible Alarm sounds, it may be muted by pressing the Alarm Mute push-button. Automatic muting will take place after two minutes if the mute switch is not manually operated. The Alarm Mute push-button is located above the indicators on the Ops Panel (see Figure 4–1). When the alarm is muted, it will continue to sound with short intermittent bleeps to indicate that a problem still exists. It will be silenced when all problems are cleared. (See also Thermal Shutdown states, Section 4.5.5).

LED Test Mode

The Alarm Mute push-button can also be used to test the LEDs on the Ops Panel. When the Mute push-button is held, all LEDs will be illuminated if there are no faults present.

4.5 Troubleshooting

The following sections describe common problems, with possible solutions, which can occur with your DCS9550 1S1 Storage Expansion Unit

4.5.1 System Faults

Symptom	Cause	Action
1 The SYSTEM LED will illuminate AMBER on the SCM 2 Audible Alarm sound	The ESI processor has detected an internal fault (e.g. failure of an internal communications path)	1 Check for other AMBER LED indications on the Power Supply/Cooling modules. If there is a PSU error present there may be a communications problem with that Power Supply/Cooling module. Remove and then re-fit the module, if the problem persists then change the module. 2 Check for other AMBER LED indications on the drive carriers. If none are evident then there may either be an ESI processor problem or a Backplane problem. 3 Ops Panel module faulty. Please contact your supplier.

Note   See also Section 4.5.5.

4.5.2 Power Supply/Cooling Faults

Symptom	Cause	Action
1 Ops Panel FAULT LED AMBER 2 An AMBER LED on one or more Power Supply/Cooling Modules. 3 Audible Alarm Sounding.	1 Any power fault. 2 A fan failure. 3 A thermal condition which could cause PSU overheating.	1 Check Power On/Off Switch on rear of Power Supply/Cooling module is switched ON.(not accessible on later models) 2 Check AC Mains Connections to Power Supply/Cooling module is live. 3 Disconnect the Power Supply/Cooling module from mains power and remove the module from the system. Re-install: if problem persists, replace Power Supply/Cooling Module. 4 Reduce the ambient temperature.

4.5.3 Thermal Control

The DCS9550 1S1 Storage Expansion Unit uses extensive thermal monitoring and takes a number of actions to ensure component temperatures are kept low and also to minimize acoustic noise. Air flow is from front to rear of the enclosure.

Symptom	Cause	Action
If the ambient air is cool (below 25 °C) and the fans are observed to increase in speed then some restriction on airflow may be causing additional internal temperature rise. Note: This is not a fault condition.	The first stage in the thermal control process is for the fans to automatically increase in speed when a thermal threshold is reached. This may be caused by higher ambient temperatures in the local environment and may be perfectly normal. Note: This threshold changes according to the number of drives and power supplies fitted.	1 Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 25mm at the front and 50mm at the rear is recommended. 2 Check for restrictions due to dust build-up; clean as appropriate. 3 Check for excessive re-circulation of heated air from rear to the front, use in a fully enclosed rack installation is not recommended. 4 Check that all Blank modules are in place. 5 Reduce the ambient temperature.

4.5.4 Thermal Alarm

Symptom	Cause	Action
1 Ops Panel FAULT LED AMBER. 2 An AMBER LED on one or more Power Supply/Cooling Modules. 3 Audible Alarm Sounding. 4 Air temperature exiting PSU above 55°C.	If the internal temperature measured in the airflow through the enclosure exceeds a pre-set threshold a thermal alarm will sound.	1 Check local ambient environment temperature is below the upper 40°C specification. 2 Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 25mm at the front and 50mm at the rear is recommended. 3 Check for restrictions due to dust build-up, clean as appropriate. 4 Check for excessive re-circulation of heated air from rear to the front, use in a fully enclosed rack installation is not recommended. 5 If possible shutdown the enclosure and investigate the problem before continuing.

4.5.5 Thermal Shutdown

Important   For thermal warnings please refer to the SES specification.

An Enclosure will shut down when a critical temperature threshold is exceeded in order to prevent permanent damage to the disk drives.

4.6 Drive Carrier Module Faults

Disk drive status is monitored by a Green LED and an Amber LED mounted on the front of each Drive Carrier Module, providing the following indications:

Table 4–4   LED Functions

State	Green	Amber
No drive fitted	Off	Off
Drive Power ON	On	Off
Drive Activity	On/Blink off	Off
Drive Fault	On	On

Drive activity - LED may be off for a length of time during power up.

4.6.1 Dummy Carrier Modules

Dummy Carrier modules must be fitted to all unused drive bays to maintain a balanced air flow.

4.7 Dealing with Hardware Faults

Ensure that you have obtained a replacement module of the same type *before* removing any faulty module.

> **ATTENTION** **If the DCS9550 1S1 Storage Expansion Unit is powered up and you remove any module, replace it immediately. If the subsystem is used with modules or module blanks missing for more than a few minutes, the Enclosure can overheat, causing power failure and data loss. Such use will invalidate the warranty.**

- Replace a faulty drive with a drive of the same type and equal or greater capacity.

- All drive bays must be fitted with a Drive Carrier module or a dummy carrier module in order to maintain a balanced air flow.

- All the supplied plug-in power supply units, electronics modules and blank modules must be in place for the air to flow correctly around the cabinet.

4.8 Continuous Operation During Replacement

Depending on how the subsystem is set up, if a disk unit fails, it can normally be replaced without interrupting the use of the system.

In addition, each enclosure contains two Power Supply/Cooling modules, either of which can maintain power and cooling to the subsystem while the other is replaced.

4.9 Replacing a Module

> **ATTENTION** **Whenever replacing a module NEVER leave an EMPTY bay in the rear of the enclosure, obtain a replacement before removing the problem part.**

Please refer to 2 , "Installation" for information on the initial installation of the plug-in modules in the DCS9550 1S1 Storage Expansion Unit.

Caution *Observe all conventional ESD precautions when handling the DCS9550 1S1 Storage Expansion Unit modules and components. Avoid contact with Backplane components and module connectors, etc.*

4.9.1 Power Supply/Cooling Modules

Danger   **Do not remove covers from the Power Supply/Cooling (PSU) module. Danger of electric shock inside. Return the PSU to your supplier for repair.**

4.9.1.1 Removing a Power Supply/Cooling Module

ATTENTION   **Do not remove the faulty Power Supply/Cooling module unless you have a replacement unit of the correct type ready for insertion.**

If a power supply unit or its fan is faulty, you must replace the whole Power Supply/Cooling module.

As there should always be two power supply units installed, you can continue working while replacing the faulty module.

1   Make sure you identify the faulty Power Supply/Cooling module correctly, from the two modules installed.

2   Switch off and disconnect the power supply cord.

3   Squeeze the two latches on the PSU handle together (Figure 4–2) and open the handle to cam the PSU out of the enclosure (Figure 4–3).

4   Grip the handle and withdraw the PSU (Figure 4–4).

4.9.1.2 Inserting the Module

1   Check for damage, especially to the rear connector on the PSU.

ATTENTION   **Handle the module carefully and avoid damaging the connector pins. Do not install the module if any pins appear to be bent.**

2   With the PSU handle (Figure 4–3) in the open position, slide the module into the enclosure.

Important   Install the Power Supply/Cooling module in the right hand bay (Rear Bay 1) of the enclosure in an "upside down" orientation. If necessary, reorient the power cord clip so that the power cord can be properly retained.

3   Cam the module home by manually closing the PSU handle (see Figure 4–4). A click should be heard as the handle latches engage (see Figure 4–2).

4   Connect the power supply cord to the power source and switch the power supply ON.

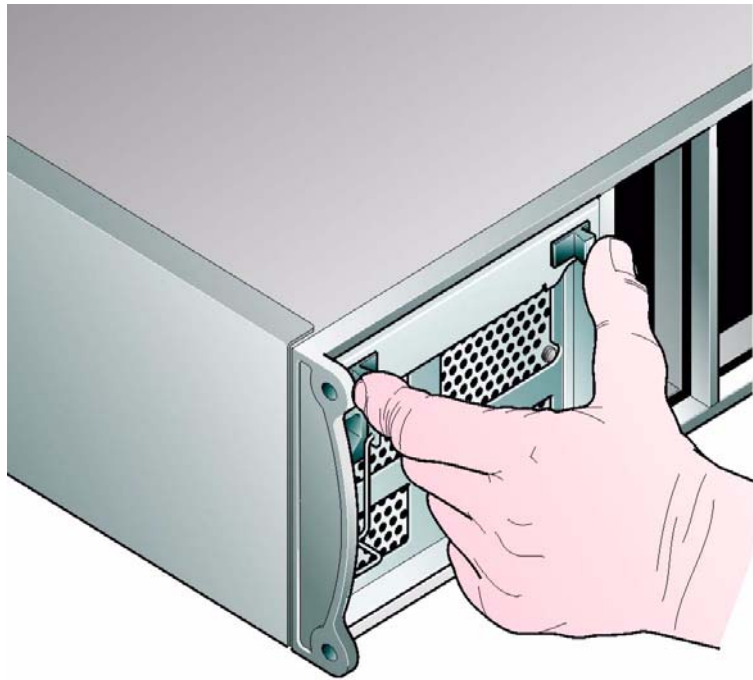**Note**   The alarm will sound until the new Power Supply/Cooling module is operating correctly.

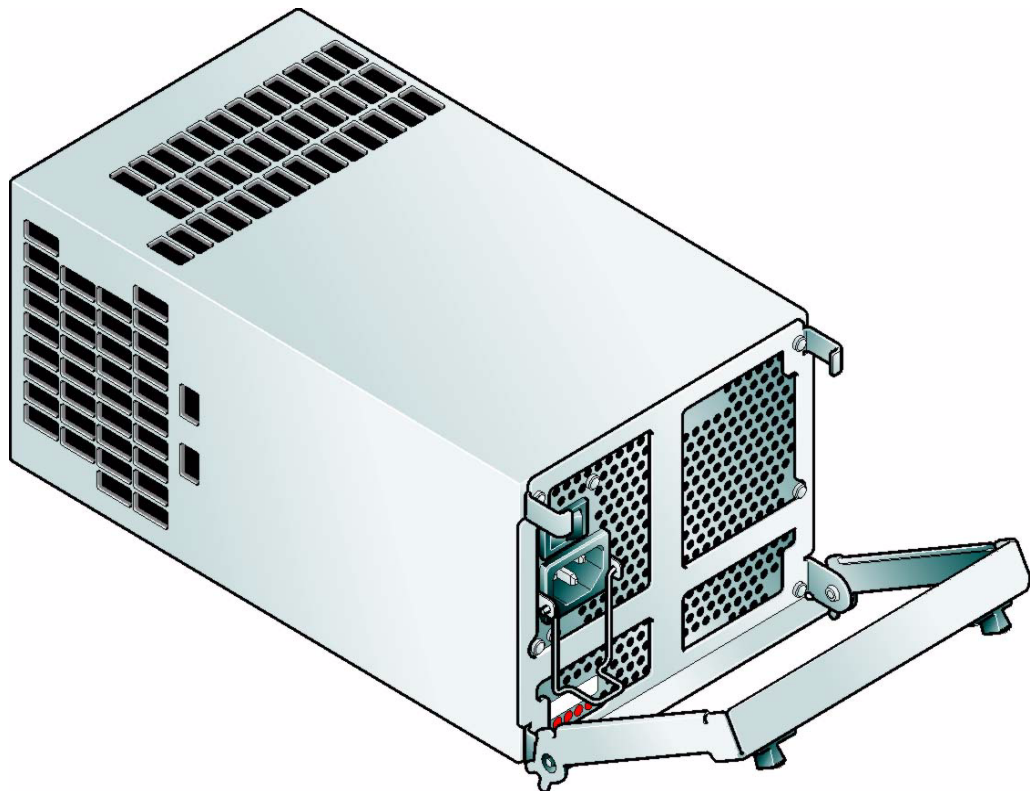**Figure 4–2**   Removing/Inserting an AC Power Supply/Cooling Module (1)

Figure 4–3   Removing/Inserting an AC Power Supply/Cooling Module (2)
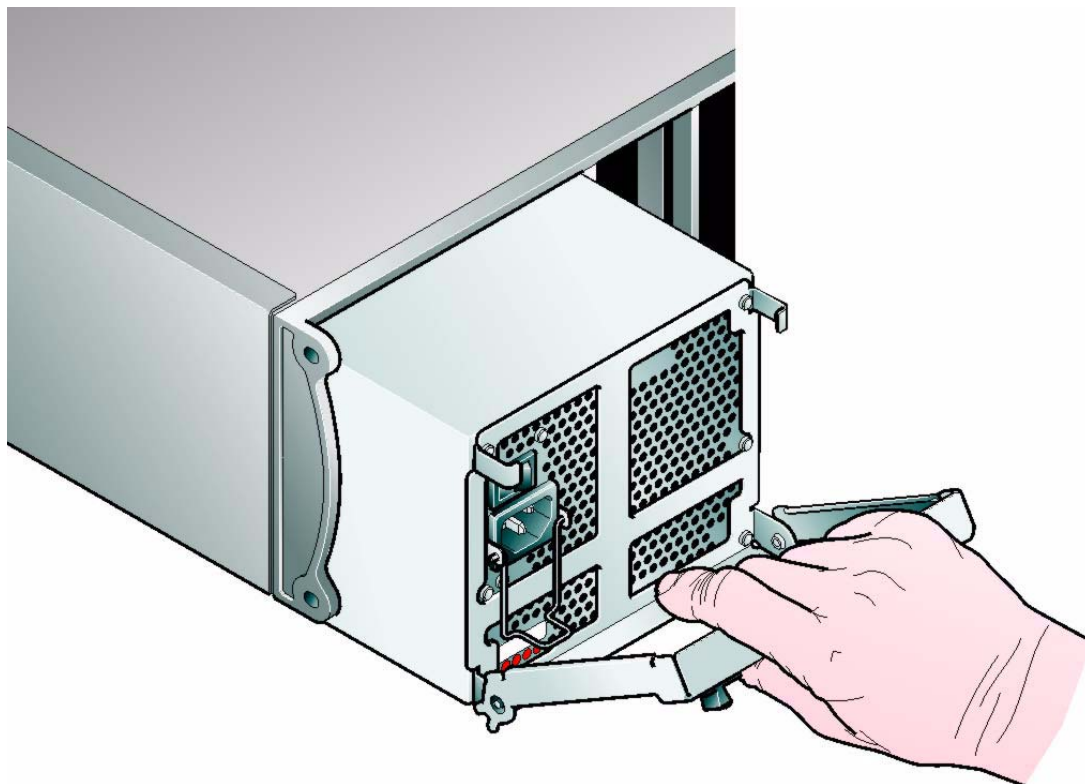
Figure 4–4   Removing/Inserting an AC Power Supply/Cooling Module (3)

4.9.2 Ops Panel

The Ops Panel is an integral part of the enclosure chassis assembly and is not field replaceable.

4.9.3 SCM I/O Module

Please refer to section 2.7, "SCM I/O Module Installation", on page 23 for full information on installing the SCM I/O module.

4.9.3.1 Removing the Module

> **ATTENTION**   **Do not remove this module unless a replacement can be immediately added. The system must not be run without all units in place.**
>
> **Electrically this unit can be hot plugged but the FC connection will be disconnected.**

1   Using two hands, grasp each latch between the thumb and forefinger of each hand. Squeeze thumb and forefinger together to release the latch. Pull the latches forward to cam the module out of the enclosure (Figure 4–7).

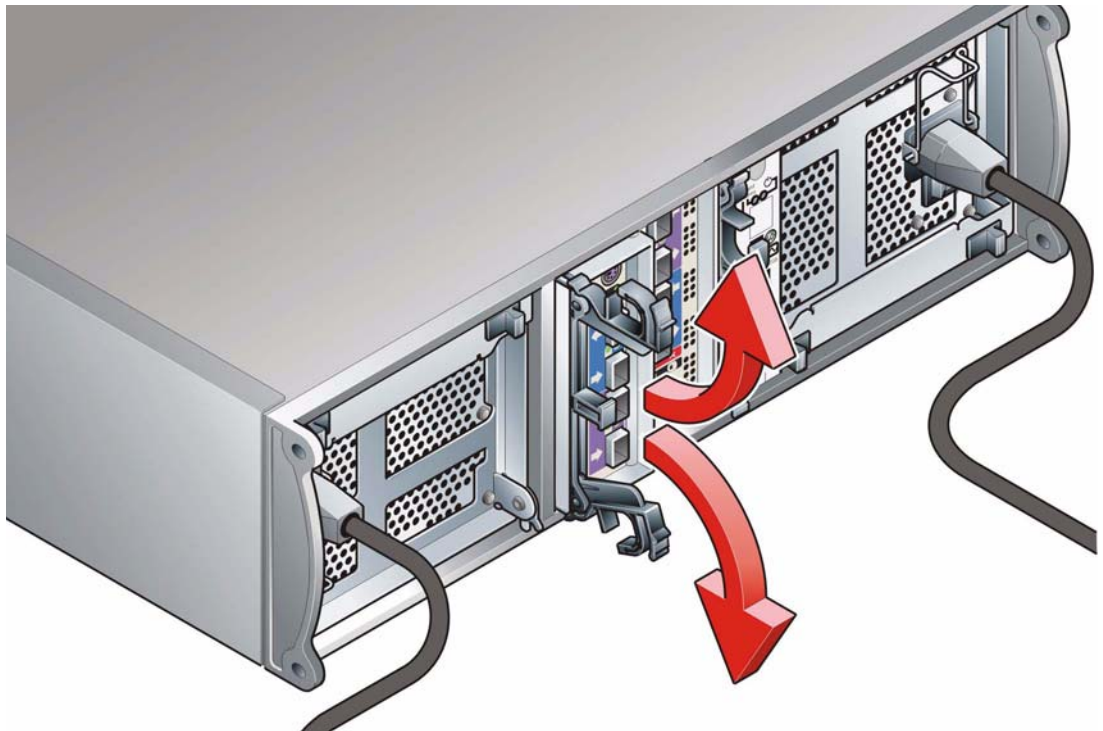**2**   Grip the latch handles and withdraw the module (Figure 4–5).
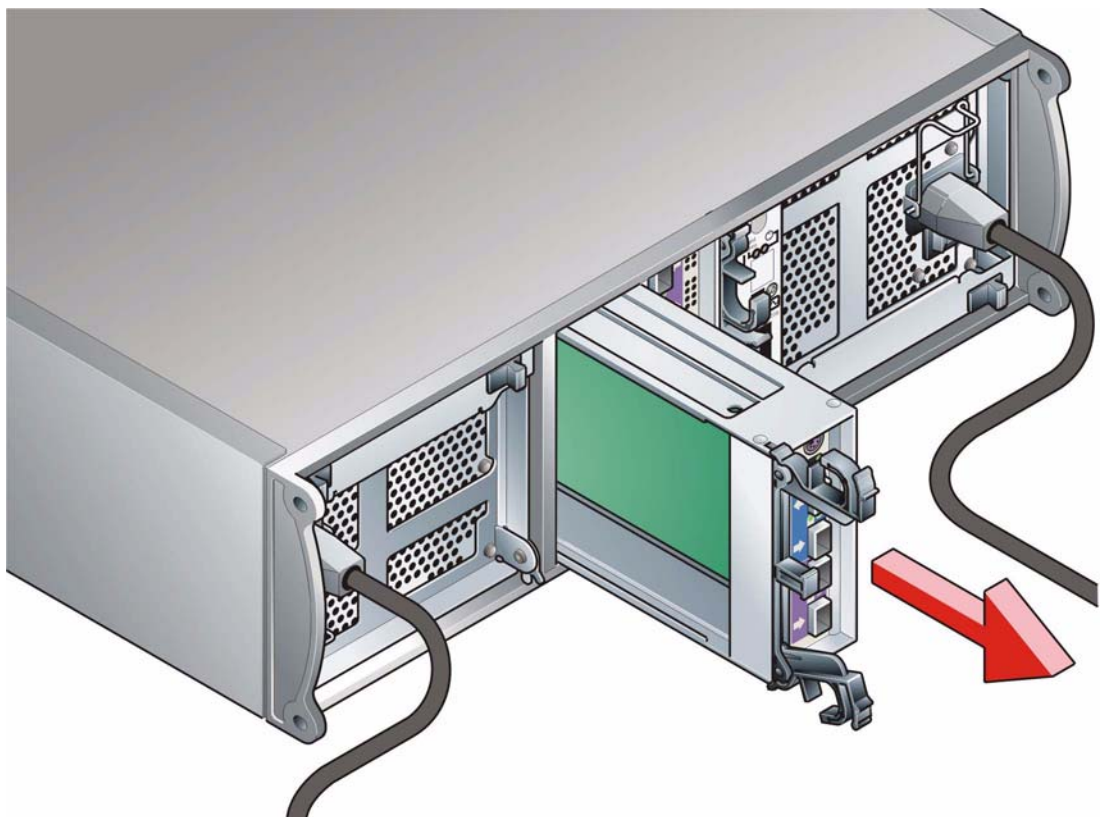
Figure 4–5   Removing an SCM I/O Module (1)

Figure 4–6   Removing an SCM I/O Module (2)

4.9.3.2 Inserting the Module

ATTENTION **If only one SCM module is fitted, it must be installed in Module B location (Rear Bay 4) [see Figure 2–1, "Module locations", on page 16] and an I/O blank module fitted in the unused bay.**

1 With the latch in the open position, slide the SCM I/O module into the enclosure until the latch engages automatically.

2 Cam the module home by manually closing the latches (see Figure 4–7).

3 A click should be heard as the latch engages.
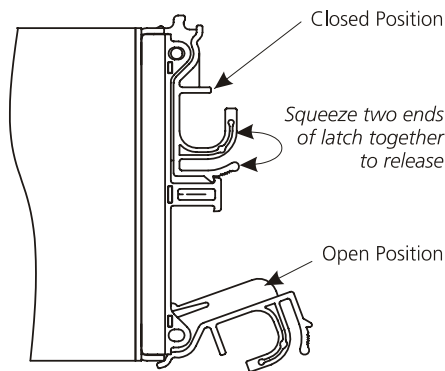

Figure 4–7 SCM I/O Module Latch Operation

4.9.4 Drive Carrier Module

Please see section 2.9 for information on the initial installation of the plug-in modules in the DCS9550 1S1 Storage Expansion Unit.

Caution *Observe all conventional ESD precautions when handling the DCS9550 1S1 Storage Expansion Unit modules and components. Avoid contact with backplane components and module connectors, etc.*

4.9.4.1 Removal and Replacement

ATTENTION **Drive spin down**
Damage can occur to a drive if it is removed while still spinning. If possible use the operating system to spindown the drives prior to removal. If this is not possible we recommend that you perform All steps of the following procedure to ensure that the drive has stopped prior to removal:

1 Release the carrier handle, by pressing the latch in the handle towards the right

Note The anti-tamper lock must be off.

2 Gently withdraw the Drive Carrier Module approximately1 inch (25mm) and wait 30 seconds.

3 Withdraw the module from the drive bay and fit a replacement module in accordance with the instructions in Section 2.9.

4.10 Spare Parts and Ancillary Items

The following replaceable parts are available for the DCS9550 1S1 Storage Expansion Unit:

IBM MTM 1269-1S1 SATA Disk Chassis FRUs	
IBM Part Number	**Description**
95P5297	1269-1S1 SATA disk chassis assembly FRU without drives
95P5313	power supply/fan FRU
95P5315	SCM I/O Module FRU
95P5316	Op panel FRU
95P5317	drive module key
95P5318	power cord FRU
95P5319	cable RS232 config FRU
95P5320	rail kit FRU
95P5326	250GB SATA HDD FRU for FC 3010
95P5327	500GB SATA HDD FRU for FC 3012
95P5325	Drive Filler FRU
95P7184	Blank SCM module filler

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Glossary

In glossary definition*s, italics* are used for items defined elsewhere in the glossary and **bold** is used for the items shown in brackets after the main heading of the entry.

ASCII   American Standard Code for Information Interchange. A 7-bit binary code (0's, 1's) used to represent letters, numbers, and special characters such as $,!, and /. Supported by almost every computer and terminal manufacturer.

ATA   (Advance Technology Attachment)   A disk drive interface standard based on a 16-bit bus and dealing with the power and data signal interfaces between the motherboard and the integrated disk controller and drive. The ATA "bus" only supports two devices - master and slave.

Attribute   Setting that controls access to a specific file. Often used to protect important files (such as the Registry files) from accidental change or deletion. Set using the ATTRIB command in MS-DOS.

Backplane   A printed circuit board incorporated in the chassis assembly to provide logic level signal, and low voltage power distribution paths.

Bay   The slot that a unit or media device fits into.

Byte   A group of binary digits stored and operated upon as a unit. A byte may have a coded value equal to a character in the ASCII code (letters, numbers), or have some other value meaningful to the computer. In user documentation, the term usually refers to 8-bit units or characters.
1 kilobyte (K) is equal to 1,024 bytes or characters; 64K indicates 65,536 bytes or characters.

Cable   Throughout this DCS9550 1S1 Storage Expansion Unit user guide this term is used in accordance with the preferred US context of: "an insulated flexible electric wire used for the transmission of data signals between computer equipment."
Note: Cable is UK preferred terminology for either a power cord or a data cable:

Character   A representation, coded in binary digits, of a letter, number, or other symbol.

Characters Per Second   A data transfer rate generally estimated from the bit rate and the character length. For example, at 2400 bps, 8-bit characters with Start and Stop bits (for a total of ten bits per character) will be transmitted at a rate of approximately 240 characters per second (cps).

Chassis   A sheet metal enclosure incorporating a Backplane PCB, an integral *Ops Panel.*and a module runner system. The chassis contains a number of 'Bays', each of which can accommodate a plug in module. There are sixteen *drive* carrier bays at the front and five bays at the rear which house *power supply/cooling* and SCM *I/O modules.*

Configure   To set up a hardware device and its accompanying software.

Data Communications   A type of communications in which computers and terminals are able to exchange data over an electronic medium.

Disk (drive, carrier, module)   A SATA disk **drive** mounted in a **carrier**. You can have up to sixteen disk drive carrier **modules** in each DCS9550 1S1 Storage Expansion Unit.

Enclosure   The chassis assembly which houses the plug-in modules that make up the DCS9550 1S1 Storage Expansion Unit.

ESI/Ops module   A unit used to monitor and control all elements of the Enclosure. The **ESI/Operators (Ops)** panel is supplied as an integral part of the RS-1602 series Enclosure core product

Hot plugging   A device with the capability of being connected to a subsystem without interrupting the power supplies to that subsystem.

Hot swap   Hot swapping is the term used for manually swapping a failed disk unit with a replacement while the DCS9550 1S1 Storage Expansion Unit subsystem is in normal use.

Hz (Hertz)   A frequency measurement unit used internationally to indicate cycles per second.

Initialize   To prepare a hardware device for use.

LED   Light Emitting Diode. A small light displayed on the cabinet, disk units and power supply units.

Module (power supply, drive, I/O)   A module is a power supply, disk drive or electronics unit held in a carrier that plugs into a bay inside the enclosure. An IBM System Storage DCS9550 1S1 Storage Expansion Unit can contain sixteen **drive** modules, two **power supply/cooling modules** and two **SCM I/O** modules.

Operating system   The software running the host computer. For example, on PCs it is often Windows 95/98, Windows NT or OS/2 and on Hewlett-Packard machines it could be HP-UX.

Parallel Transmission   The transfer of data characters using parallel electrical paths for each bit of the character, for example, 8 paths for 8-bit characters. Data is stored in computers in parallel form, but may be converted to serial form for certain operations. See *Serial Transmission*.

Power Cord   Throughout this DCS9550 1S1 Storage Expansion Unit user guide this term is used in accordance with the preferred US context of: "an insulated flexible electric wire fitted with connectors at each end and used for the transmission of electrical power to computer equipment.

Protocol   A system of rules and procedures governing communications between two or more devices. Protocols vary, but communicating devices must follow the same protocol in order to exchange data. The format of the data, readiness to receive or send, error detection and error correction are some of the operations that may be defined in protocols.

Redundant   Not essential.

SCM I/O module (Serial ATA Control I/O module)   A plug-in module providing FC-AL channel external cable interface with 16 (Serial or Parallel) *ATA drives*.

Serial Transmission   The transfer of data characters one bit at a time, sequentially, using a single electrical path. See *Parallel Transmissio*n.

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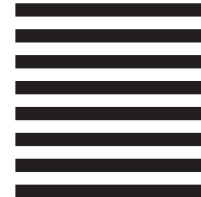Fold and Tape   **Please do not staple**   Fold and Tape

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